V-850 Atom Infant Incubator

OPERATING MANUAL

Printed in Jan. 1993

ER

3

ATOM MEDICAL CORPORATION

It is highly recommednded that you read this Manual carefully and familiarize yourself with this Incubator thoroughly by applying power to the empty unit and operating its various features including temperature control, humidity control, oxygen supply, etc. before placing the unit in actual service, so that you may use it with confidence.

This Manual is intended for use with four different types of incubators; V-850 SC, V-850 MC, V-850W MC. Skip unnecessary sections unrelated to your model.

CONTENTS

[1] Specifications

1-1 V-850 incubator 1

1-2 V-850W double-wall incubator 5

[2] Nomenclature and Functions

2-1 Manual control type (MC) 6

2-2 Servo control type (SC) 10

2-3 Air circulation system of V-850 incubator 14

2-4 Double-wall effect and air circulation system of V-850W incubator 16

[3] Incubator Installation 18

[4] Operating Instructions

4-1 Operation of manual control unit 20

4-2 Operation of servo control unit 27

[5] Humidity Control 38

6 Oxygen Supply 43
7 Alarms 48
8 Operation of Other Mechanisms 54
9 Management of Incubator in Use 60
10 Cleaning, Disinfection and Maintenance 63
11 Troubleshooting Guide 74
12 Cautions for Safe Incubator Operation 79

1 SPECIFICATIONS

1-1 V-350 incubator

1-1-1 Manual control type

Electrical requirements: Customer-specified

Incubator temperature adjustment: Manual control system

Incubator temperature setting: 25.0 - 38.0°C in 0.1°c steps

Incubator temperature indication: 20.0 - 42.0°C in 0.1°C steps

Wall temperature/humidity indication: Switch-selected.

Wall temperature : 20.0-42.0°C in 0.1°C steps

Humidity : 20-99% in 1% steps

Heater output: 0 - Full, indicated in ten degrees

Humidity supply: Adjustment range: Max. humidity of over 70% with the atmospheric humidity of 50%, Max. humidity of over 80% with the high humidification pad installed.

Oxygen supply: Adjustment range: 21-80%

>37°C indication: Should the incubator temperature exceed 37°C with the incubator temperature set within the range of 37-38°C, " >37°C" indicator will light up and an audible alarm sound, indicating that the incubator temperature is set to a high level.

Alarms: Audible and visible alarms for over-temperature, internal circulation, set temperature, internal sensor and power failure. Some displayed values also flash.

Alarm disable: The audible alarm for set temperature is disabled for fifteen minutes when the switch is pressed.

Memory function: Should power supply be interrupted due to power failure or other causes, the set vallue for temperature and items to be displayed will be retained in memory, so that it will be unnecessary to reset when power returns.

Accessories:

Cap (rubber stopper)	1
I.D. card	25
High humidification pad	3
Humidity sensor wetter	10
Filler (for filling water reservoir)	1
Air intake adjustment ring for 60Hz (Needed only in 60Hz areas)	1
Dust cover	1

Spares:

F-4 filter element	1
Access port cover	5

■ Air intake adjustemnt ring for 60Hz

Use of the unit in a 60Hz area will increase the air intake amount by some 20%. Therefore, if the incubator is to be used in such an area, remove, prior to using the incubator, the filter cover from the rear of the unit and attach the air intake adjustment ring for 60Hz to the rubber seal for the air intake pipe fitted in the filter case.

1-1-2 Servo control type

Electrical requirements: Customer-specified

Skin temeprature adjustment: Servo control system
(MC also available)

Skin temperature setting: 34.0-38.0°C in 0.1°C steps

Skin temperature indication: 30.0-42.0°C in 0.1°C steps

Incubator temperature setting: 25.0-38.0°C in 0.1°C steps

Incubator temperature indication: 20.0-42.0°C in 0.1°C steps

Wall temperature/humidity indication: Switch-selected.

Wall temeprature: 20.0-42.0°C in 0.1°C steps

Humidity : 20-99% in 1% steps

Heater output: 0-Full, indicated in ten degrees

Humidity supply: Adjustment range: Max. humidity of over 70% with the atmospheric humidity of 50%,
Max. humidity of over 80% with the high humidification pad installed.

Oxygen supply: Adjustment range: 21-80%

>37°C indication: Should the incubator temperature exceed 37°C, ">37°C" indicator will light up and an audible alarm sound.

Alarms: Audible and visible alarms for over-temperature, internal circulation, set temperature, internal sensor, skin temperature probe and power failure. Some displayed values also flash.

Alarm disable: The audible alarm for set temperature is disabled for fifteen minutes when the switch is pressed.

Memory function: Should power supply be interrupted due to power failure or other causes, the set values for skin temeperature and incubator temperature, mode of operation and items to be displayed will be retained in memory, so that it will be unnecessary to reset when power returns.

Accessories: Skin temperature probe (case) 1

Cap (rubber stopper) 1

I.D. card 25

High humidification pad 3

Humidity sensor wetter 10

Filler (for filling water reservoir).. 1

Air intake adjustment ring for 60Hz .. 1

Dust cover 1

Spares: F-4 filter element 1

Access port cover 1

1-2 V-850W double-wall incubator

Hood: Double-wall

Air curtain mechanism

Four snap-open access ports (semi-iris)

Humidity supply: Adjustment range: Max. humidity of over 65% with the atmospheric humidity of 50%, Max. humidity of over 75% with the high humidification pad installed.

Spares: F-4 filter element 1

Access port cover 2

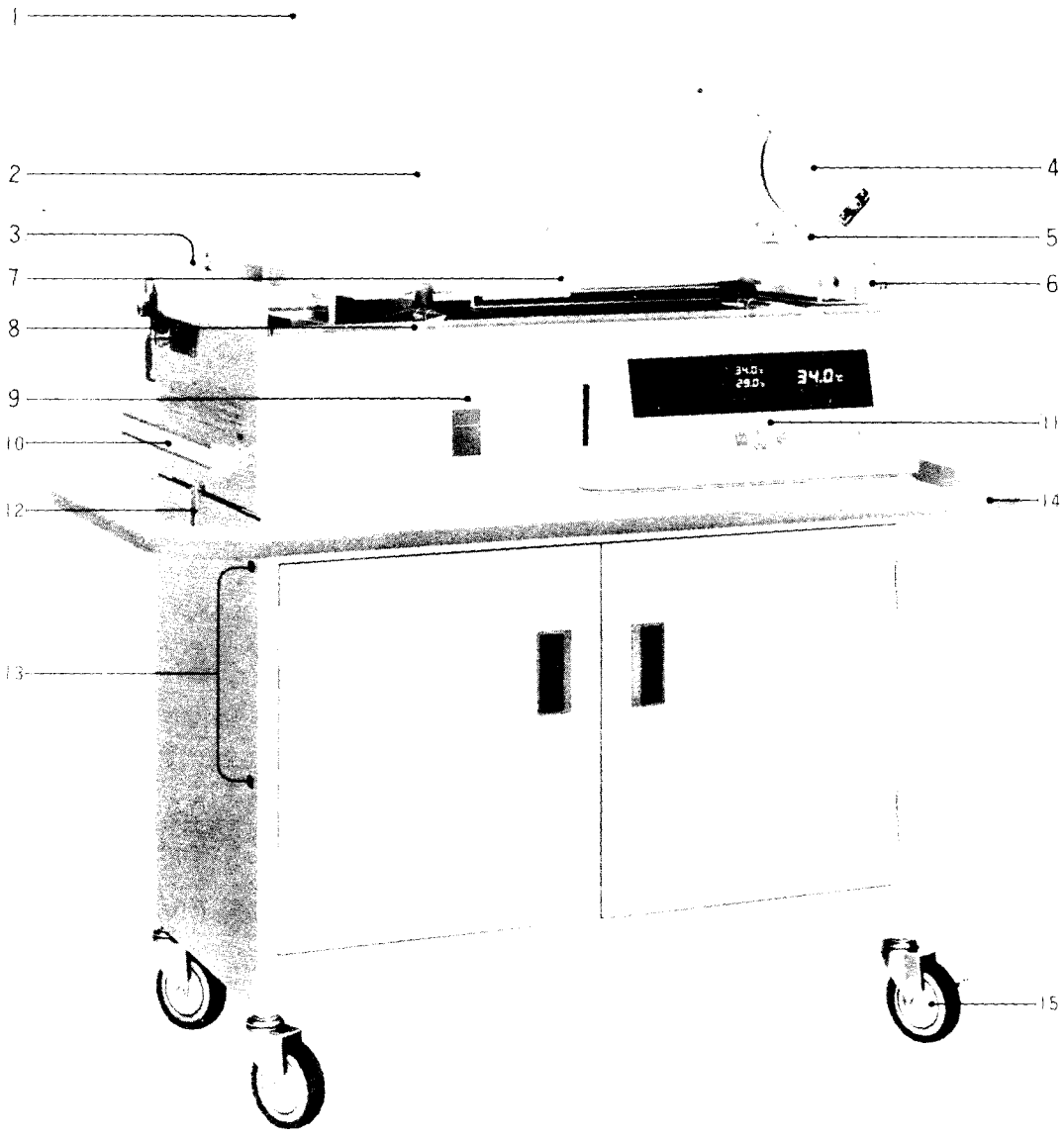
Access port cover (for semi-iris port) 4

* Other specifications are identical with those for V-850SC and V-850MC respectively.

2 NOMENCLATURE AND FUNCTIONS

2-1 Manual control type

2-1-1 Nomenclature



● Hood section

① I.D. card holder

② Access port (Iris)

③ Humidity control knob

④ Snap-open auxiliary access port

⑤ Sensor block

⑥ Tube inlet

● Base section

⑦ Mattress platform

⑧ Mattress platform tilting arm

⑨ Humidity reservoir cover

⑩ M.F. rail (right and left)

⑪ Power unit

● Cabinet section

⑫ Incubator-Cabinet Stand connecting hook

⑬ I.V. pole mounting holes (right and left)

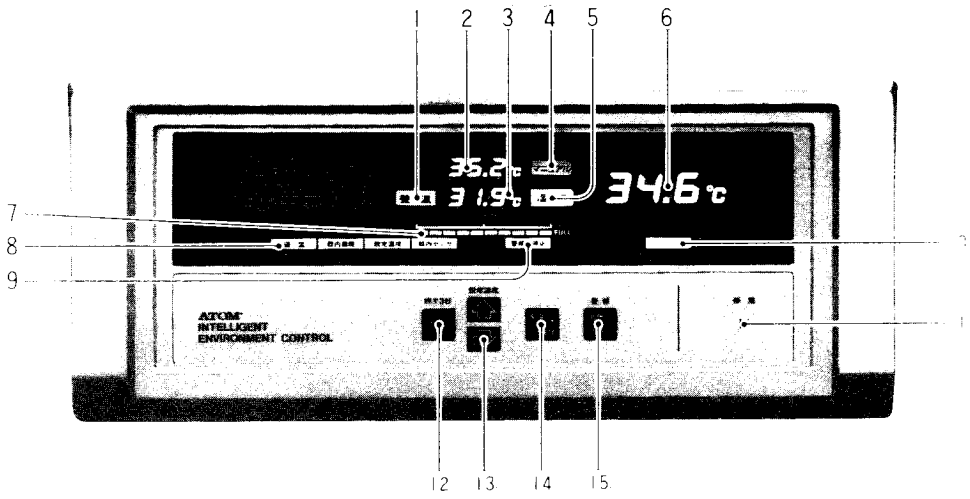
⑭ Guard rail (optional)

⑮ Caster

▶The guard rail shown above is optional.

2-1-2 Power unit

The microprocessor in the Manual Control Type ATOM Incubator minimizes the stress on the infant from environmental temperature variation by preventing overshoot and controlling the internal temperature around the infant within ±1/4°C of the prescribed level.

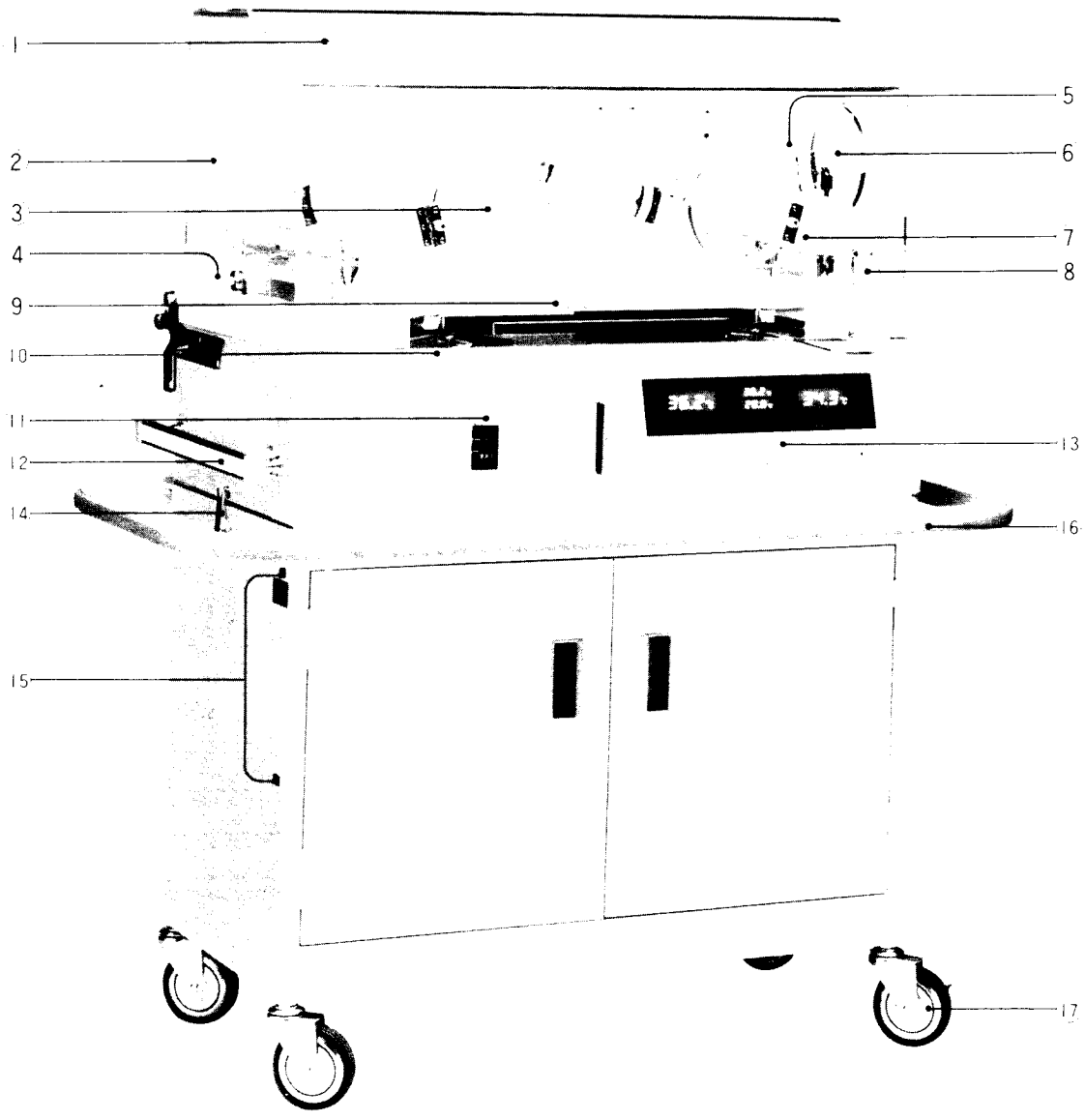


Number	Description	Function
①	Wall temperature indicator lamp	Indicates with lit-up letters that wall temperature is displayed.
②	Set temperature display	Displays set incubator temperature digitally.
③	Wall temeprature/ humidity display	Displays either wall temperature or humidity (switch-selectable) digitally.
④	Manual indicator lamp	Indicates with lit-up letters that the unit is operating in manual control system.
⑤	Humidity indicator lamp	Indicates with lit-up letters that humidity is displayed.
⑥	Incubator temperature display	Displays incubator temperature digitally.
⑦	Heater output indicator lamp	Indicates heater output in ten degrees from 0 to Full.

⑧	Alarm indicator lamps	Flashes respectively for over-temperature, internal circulation, set temperature or internal sensor alarm.
⑨	Alarm disable indicator lamp	Lights up when an audible alarm for set temperature is disabled.
⑩	>37°C indicator lamp	Lights up should the incubator temperature exceed 37°C.
⑪	Power failure indicator lamp	Lights up should power supply be interrupted due to power failure, a disconnected power plug or other causes.
⑫	Set switch	Press continuously for approx. three seconds to change set temperature, and "Manual" flashes.
⑬	Set temperature switch	Press while "Manual" is flashing to set to the desired temperature.
⑭	Wall temperature/ humidity changeover switch	Press and select either wall temperature or humidity while indication is changed over in the following order: "WALL" ⇄ blank ⇄ "RH".
⑮	Alarm reset switch (Alarm disable switch)	Press after the unit is returned to normal conditions to reset alarms. The audible alarm for set temperature can also be disabled for fifteen minutes with this switch.

2-2 Servo control type

2-2-1 Nomenclature



● Hood section

① I.D. card holder

② Access port (Iris)

③ Snap-open access port

④ Humidity control knob

⑤ Front door

⑥ Front door latch (right and left)

⑦ Sensor block

⑧ Tube inlet

● Base section

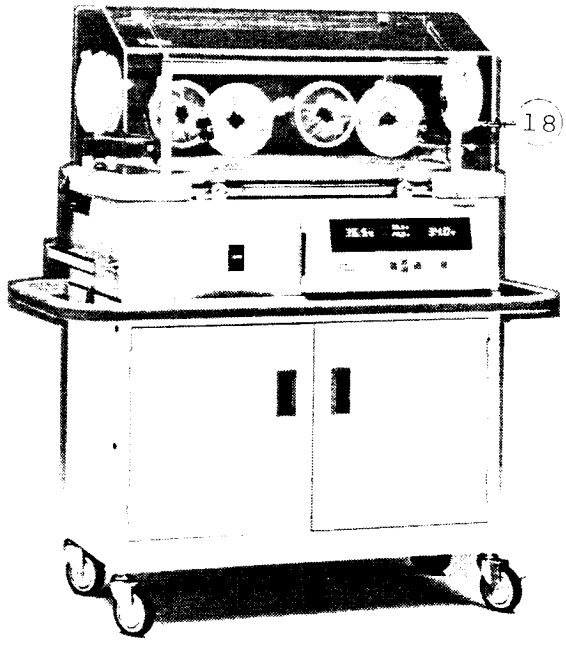
⑨ Mattress platform

⑩ Mattress platform tilting arm

⑪ Humidity reservoir cover

⑫ M.F. rail (right and left)

⑬ Power unit



V-850WSC

● Cabinet section

⑭ Incubator-Cabinet Stand connecting hook

⑮ I.V. pole mounting holes (right and left)

⑯ Guard rail (optional)

⑰ Caster

▶The guard rail shown above is optional.

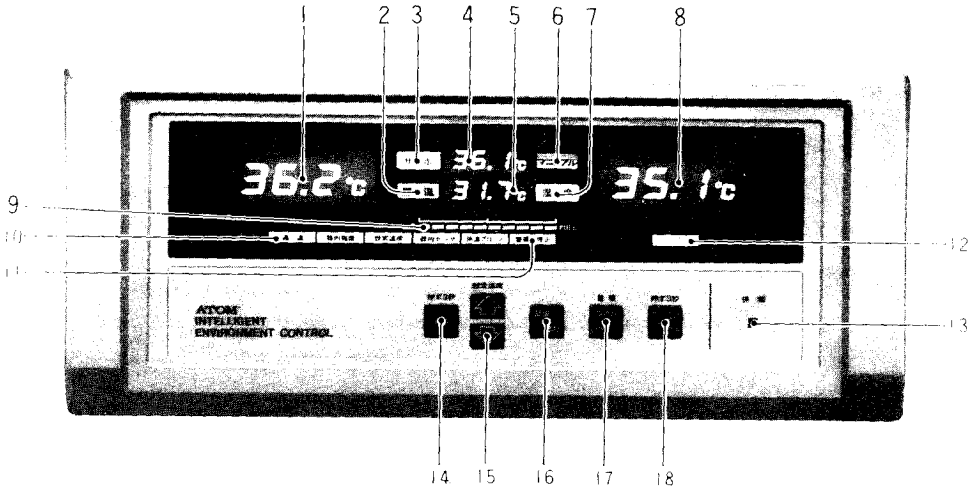
● Hood section

Double-wall hood

⑱ Snap-open access port (semi-iris)

2-2-2 Power unit

This system detects minute variations in skin temperature with a precision temperature probe attached to the infant's abdomen and supplies an incubator temperature needed to keep skin temperature at a preset level. It also maintains an optimum environmental temperature by calculating an accurate balance between the infant's skin temperature and the incubator temperature so that low incubator temperature due to an attack of fever and other causes may be prevented.



Number	Description	Function
①	Skin temperature display	Displays skin temperature digitally.
②	Wall temperature indicator lamp	Indicates with lit-up letters that wall temperature is displayed.
③	Servo indicator lamp	Indicates with lit-up letters that the unit is operating in servo control system.

④	Set temperature display	Displays digitally either set skin temperature in servo control system or set incubator temperature in manual control system. Either control system is selectable.
⑤	Wall temperature/ humidity display	Displays either wall temperature or humidity (switch-selectable) digitally.
⑥	Manual indicator lamp	Indicates with lit-up letters that the unit is operating in manual control system.
⑦	Humidity indicator lamp	Indicates with lit-up letters that humidity is displayed.
⑧	Incubator temperature display	Displays incubator temperature digitally.
⑨	Heater output indicator lamp	Indicates heater output in ten degrees from 0 to Full.
⑩	Alarm Indicator lamps	Flashes respectively for over-temperature, internal circulation, set temperature, internal sensor or skin temperature probe alarm.
⑪	Alarm disable indicator lamp	Lights up when an audible alarm for set temeprature is disabled.
⑫	> 37°C indicator lamp	Lights up should the incubator temperature exceed 37°C.
⑬	Power failure indicator lamp	Lights up should power supply be interrupted due to power failure, a disconnected power plug or other causes.

⑭	Set switch	Press continuously for approx. three seconds to change set temperature, and "mode of operation" (Servo/Manual) flashes.
⑮	Set temperature switch	Press while "mode of operation" (Servo/Manual) is flashing to set to the desired temperature.
⑯	Wall temperature/ humidity changeover switch	Press and select either wall temperature or humidity while indication is changed over in the following order: "Wall" ⇄ blank ⇄ "RH"
⑰	Alarm reset switch (Alarm disable switch)	Press after the unit is returned to normal conditions to reset alarms. The audible alarm for set temperature can also be disabled for fifteen minutes with this switch.
⑱	Servo/Manual changeover switch	Press continuously for approx. three seconds to select either Servo or Manual.

2-3 Air circulation system of V-850 incubator

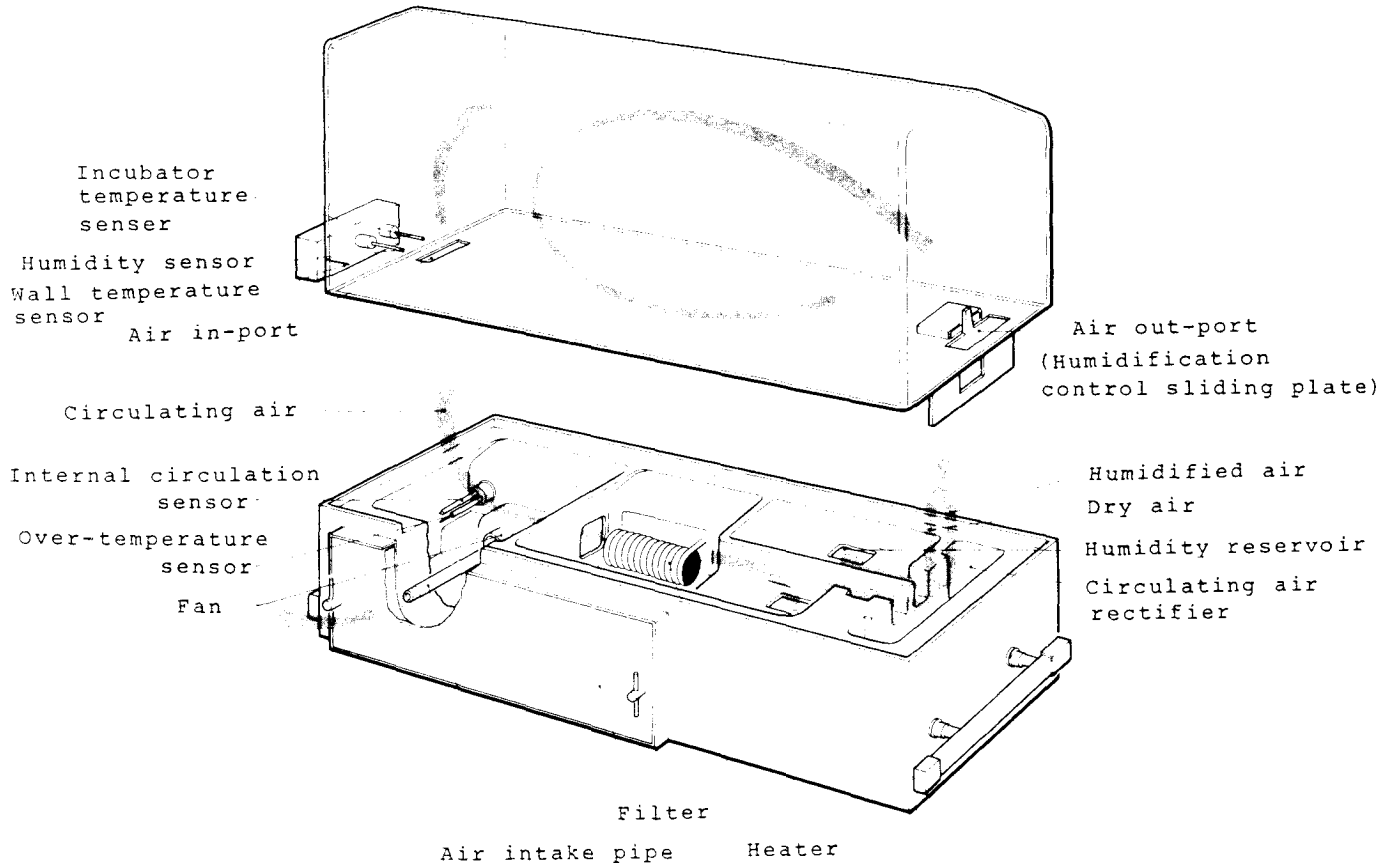
The air circulation system of V-850 ATOM Incubator is designed to provide an optimum atmospheric environment for the infant by precise temperature control, humidification and oxygen supply.

Room air and oxygen enter the unit through the filter and then are mixed.

The air filtered into the unit is sent to the heater where it is heated appropriately as directed by the control and then circulated in the incubator by the air circulating fan.

Part of the circulating air is humidified as it passes over the humidity reservoir. Both humidified air and dry air, whose flow rates are controlled by adjusting the humidification control sliding plate, enter the circulating-air rectifier to be mixed. The direction of air is rectified in this circulating-air rectifier. The air is then blown into the incubator hood to provide even temperature and humidity distribution over the mattress.

This air circulation system maintains a slight positive pressure inside the hood, and this assures effective isolation when the ports are opened momentarily for access to the infant.



2-4 Double-wall effect and air circulation system of V-850W incubator

■ Double-wall effect

It has been widely reported in a number of articles that a newborn infant placed in an incubator loses heat due to radiation, convection, evaporation and conduction; of the four factors, loss of heat due to radiation is the greatest, accounting for almost 40% of total heat loss.

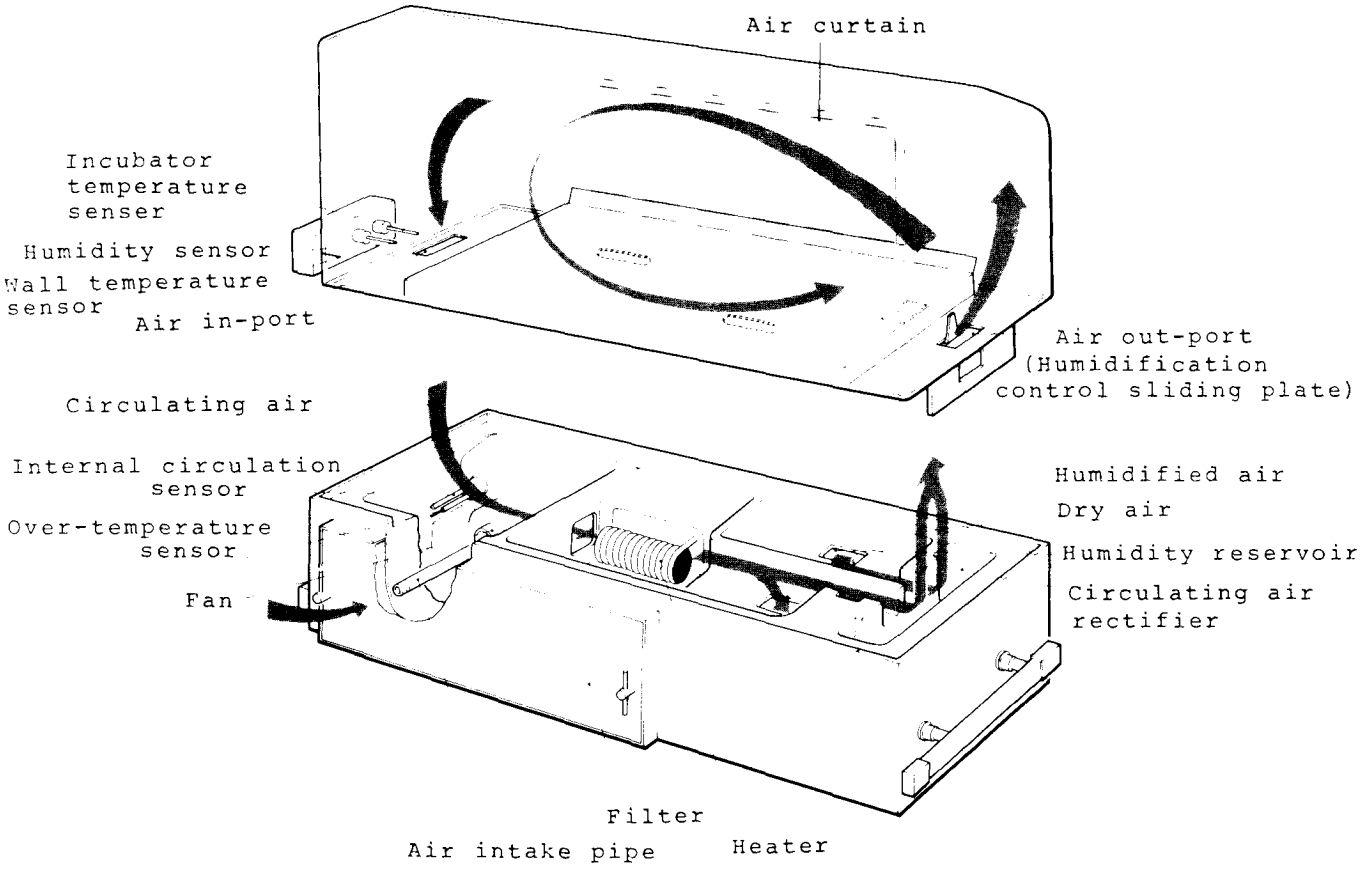
The mechanism of the double-wall incubator to prevent radiant heat loss is to minimize such heat loss by making the temperature of the inner wall facing the infant within the incubator as close to that of the incubator air as possible.

This air circulation system allows warm air to circulate effectively between the inner and outer walls, thus adding to the double-wall effect.

■ Air-curtain effect

The air circulation system has warm air outlets all along the front door to contribute to the uniform temperature distribution in the entire incubator compartment as well as to add to the double-wall effect.

The warm air outlets operate continuously, emitting a curtain of warm air even when the front door is open. Thus, the incubator temperature will not drop by more than 2°C (with the ambient temperature at 25°C), and during treatment or operation the infant's temperature will remain constant.


Air curtain
Incubator temperature senser
Humidity sensor
Wall temperature sensor
Air in-port
Air out-port (Humidification control sliding plate)
Circulating air
Internal circulation sensor
Over-temperature sensor
Fan
Humidified air
Dry air
Humidity reservoir
Circulating air rectifier
Filter
Air intake pipe
Heater

3 INCUBATOR INSTALLATION

3-1 Room temperature and influence of outside temperature

(1) The room in which the incubator is to be installed should preferably have a temperature over 23°C to minimize the radiant heat loss from the incubator.

(2) Avoid placing the incubator in direct sunlight, close to a heating apparatus or near a cold window as such locations may adversely affect the incubator temperature. Always keep the incubator at least 150cm away from a heat source.

3-2 Power outlet and grounding

- Use a power outlet near the incubator to prevent accidental contact with a trailing power cord. Use a separate outlet for each incubator.
- This unit is rated at the voltage specified by you. Do not connect the unit to any power source of a different voltage.

Rated voltage	As specified
Frequency	As specified
Power consumption	"MC" "SC" 280VA

- It is recommended that the power outlet utilized include a ground terminal.
- If no ground terminal exists in the room where the incubator is to be connected, ask hospital service personnel to

provide a ground connection. If the available ground terminal is located beyond the reach of the incubator's ground cord, an additional length of wire can be added.

- Ground peripheral electric instruments securely.

4 OPERATING INSTRUCTIONS

4-1 Operation of manual control type

The operator should fully familiarize himself with the temperature test and operation procedures by operating the incubator in a vacant state prior to placing an infant in it, and ensure that the unit operates properly.

Incubator temperature should be set in accordance with the doctor's instructions.

4-1-1 Preparation

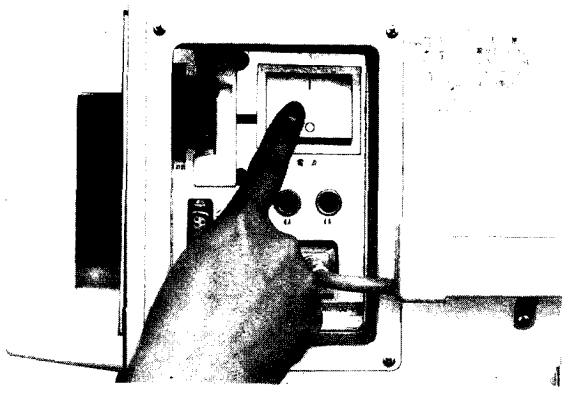
(1) Attach access port covers to iris access ports (See 10-2 on P.65)

(2) Get ready for humidity control. Set the humidification control sliding plate to the lowest level (See 5 HUMIDITY CONTROL on P.38).

4-1-2 Power source

(1) Make sure that the power cord and the sensor connector are securely connected to appropriate connecting ports

on the side panel respectively. Then plug the power cord into the power outlet (See 3-2 on P.18). (Photo: 3)



(Photo:3)

(2) Turn the power switch on. The internal program and panel displays will automatically be checked when the power switch is pressed to the ON position. The ON position is indicated by "1" and the OFF position is indicated by "0". (Photo: 3)

▶ Should alarm conditions be indicated after self-diagnosis, see [7] Alarms on P.48 for procedures.

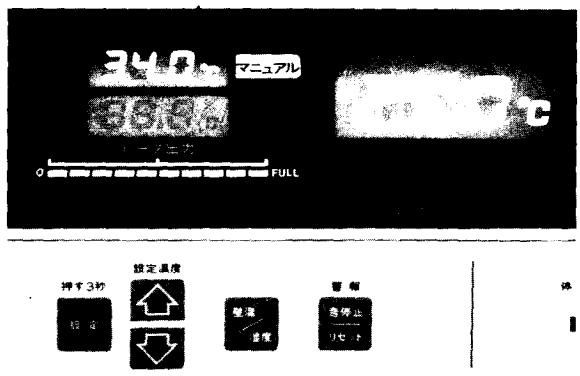
■ Memory function

Should power supply be interrupted due to power failure, a disconnected power plug or other causes, the set value for temperature and items to be displayed will be retained in memory, so that it will be unnecessary to reset when power returns. Therefore, when the power switch is turned ON, last set temperature and items to be displayed will be displayed.

4-1-3 Display and setting of incubator temperature

(1) When self-diagnosis is over, the "Manual" indicator lights up, and both incubator temperature and set temperature are displayed.

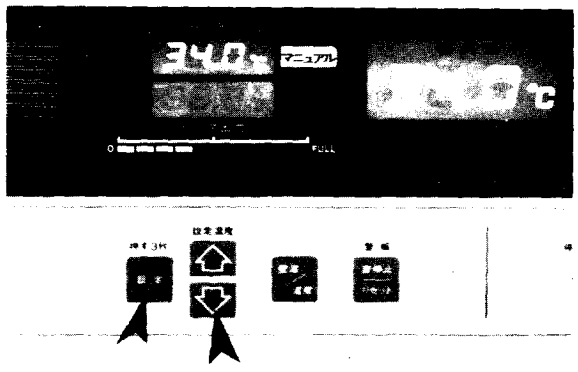
(Photo: 4)



(Photo:4)

- The incubator temperature display range is from 20.0°C to 42.0°C in 0.1°C steps. "LO" appears if the incubator temperature is below 20.0°C, while "HI" appears if above 42.0°C.
- The set temperature setting and display range is from 25.0°C to 38.0°C in 0.1°C steps.

(2) To set or change the incubator temperature, press the set switch continuously for approx. three seconds, and the "Manual" indicator will flash. Press either ⇧ or ⇩ of the set temperature



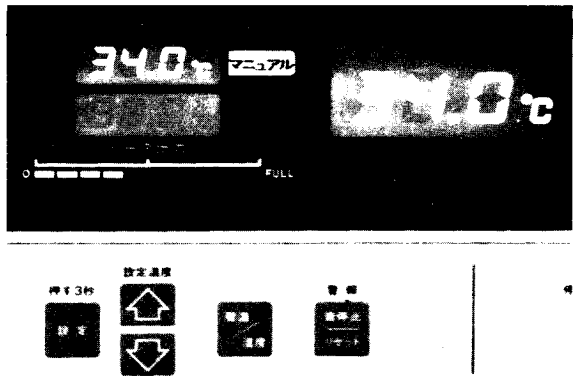
(Photo:5)

to the desired level.

(Photo: 5)

The set temperature can be changed while the "Manual" indicator is flashing. Setting is complete when the "Manual" indicator stops flashing and lights up.

(3) Wait about 50 to 60 minutes till the incubator temperature stabilizes. (Time needed for stabilization varies depending on the ambient temperature.) When the incubator temperature stabilizes around the set temperature and the heater output indicator reads steadily between 0 and 1/2, the incubator is now in the steady state. (Photo: 6)



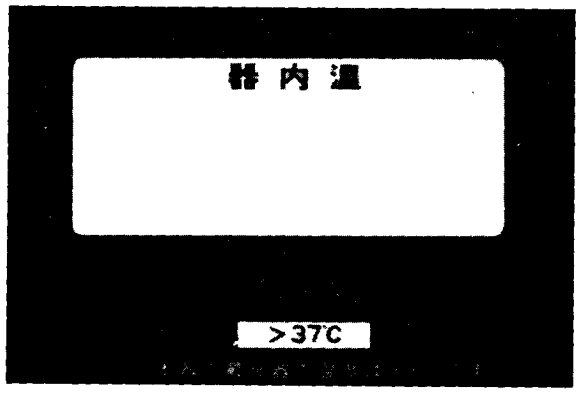
(Photo:6)

■ Heater output indication

The heater output indicator indicates the amount of heat supplied as required to maintain the incubator at the desired temperature. As the incubator temperature rises toward the desired temperature, the heat supply decreases and the reading

on the indicator lowers gradually from FULL, and when the desired incubator temperature is reached, the heater output reading remains within the balanced heat supply range between 0 and 1/2.
Thus heater output indication helps to know varying incubator temperature control.

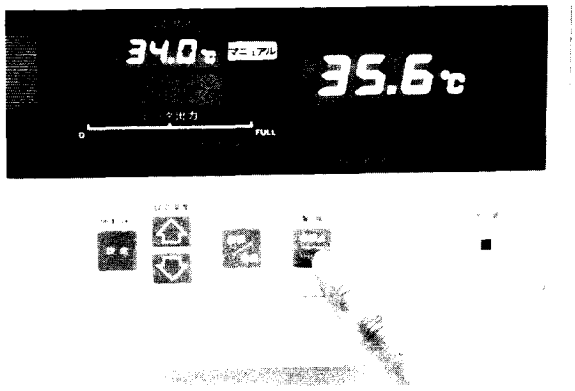
4-1-4 "＞37°C" indication
Should the incubator temperature exceed 37°C, the "＞37°C" indicator will light up and an audible alarm sound.
The incubator temperature of the unit can be set up to 38°C.
Therefore, should the incubator temeprature exceed 37°C with the temeprature set within the range of 37-38°C, the "＞37°C" indicator will light up and an audible alarm sound, indicating that the incubator temperature is set to a high level. (Photo: 7)



(Photo:7)

4-1-5 Alarms and alarm disable
Audible and visible alarms are provided for over-temeprature, internal circulation, set temperature, internal sensor and

power failure. The audible alarm for set temeprature is disabled for fifteen minutes when the alarm reset switch (alarm disable switch) is pressed. (Photo: 8)

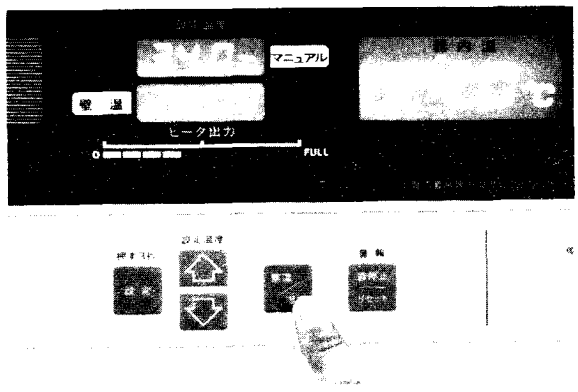


(Photo: 8)

▶ See [7] Alarms on P.48 for procedures to follow if any alarm is indicated.

4-1-6 Wall temeprature/humidity indication

Press the wall temeprature/ humidity changeover switch to select a desired display while indication is changed over in the following order: "Wall" ⇄ bland ⇄ "RH". The wall temperature display range is from 20.0°C to 42.0°C in 0.1°C steps, while the humidity display range is from 20% to 99% in 1% steps. (Photo:9)

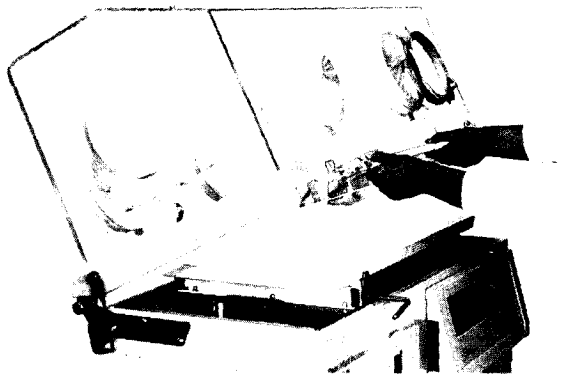


(Photo:9)

4-1-7 Placing infant in incubator (ST hood)

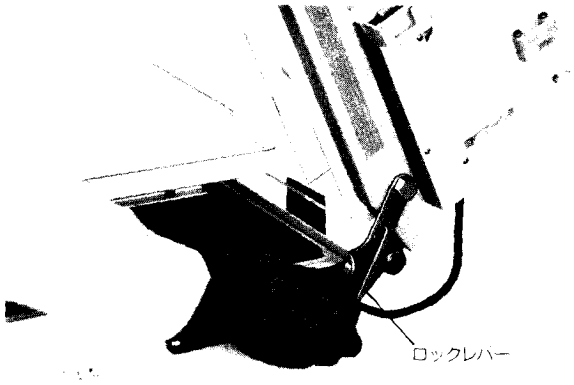
(1) Raise the lower hood front with both hands and open the

hood till it is tilted backward into the locked position, and then place the infant on the center of the mattress with the **head** to the left and the legs to the right. (Photo:10)



(Photo:10)

(2) The hood lock is provided to prevent the hood from closing accidentally.
To close the hood, hold it firmly with the left hand, pull the lock lever on the right side of the hood toward you with the right hand to release the lock, and close gently with both hands. (Photo:11)
Open and close the hood very carefully.



(Photo:11)

(3) To open or close an iris access port, turn its knob clockwise or counterclockwise respectively.

(4) The auxiliary port at the right side is provided for removing soiled material. It snaps open with a touch of the elbow against the door latch. (See 4-2-2 (2) on P.29)

4-2 Operation of servo control type

The operator should fully familiarize himself with the temperature test and operation procedures by operating the incubator in a vacant state prior to placing an infant in it, and ensure that the unit operates properly.

The incubator temperature should be set in accordance with the doctor's instructions.

The skin temperature referred to in this Manual is detected with the skin temeprature probe attached to the infant's abdomen.

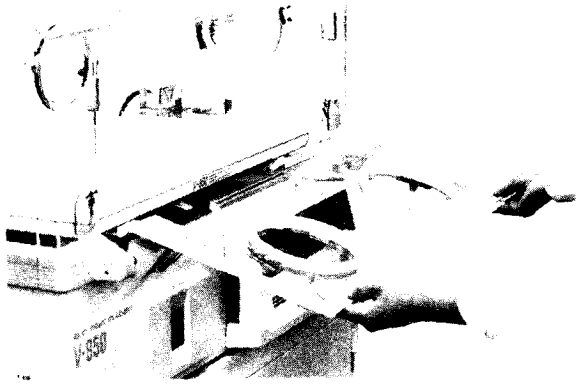
4-2-1 Preparation

(1) Check to see that the "Manual" indicator is illuminated. Should the "Servo" indicator be illuminated, press the Servo/Manual changeover switch continuously for approx. three seconds and change over to "Manual".

(2) Follow the procedures described in 4-1 "Operation of manual control type" to stabilize the incubator temperature.

4-2-2 Placing infant in incubator (I.C. hood, double-wall hood)

(1) Open the I.C. hood front door gently toward you and place the infant in the incubator. (Photo: 12) V-850W double-wall incubator is provided with warm air outlets all along the front door. The warm air outlets operate continuously, emitting a curtain of warm air. Thus, the incubator temperature will not drop by more than 2°C (with the ambient temperature at 25°C). Place the infant on the center of the mattress with the head to the left and the legs to the right. Close the hood front door after placing the infant, and then latch.



(Photo:12)

* Do not forget to latch the front door, though it is so designed as to resist accidental force applied by the

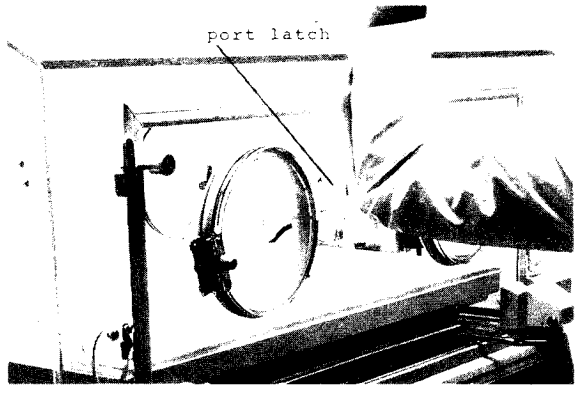
infant in the incubator.

▶ Note: Do not open the hood when placing the infant inside as it will greatly affect the incubator temperature.

(2) A gentle touch by the elbow on the port latch opens the snap-open access port through spring action.

(Photo: 13)

When closing the port, push the port to close completely.



(Photo:13)

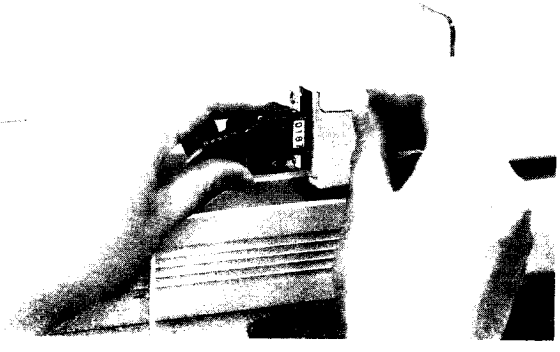
V-850W double-wall incubator is provided with semi-risis access ports inside the snap-open access port to prevent the warm air in the incubator from being dissipated when the access ports are open.

▶ NOTE 1: Check again that the port is completely closed.

▶ NOTE 2: Never leave the incubator with the front door or access ports open for the infant's safety.

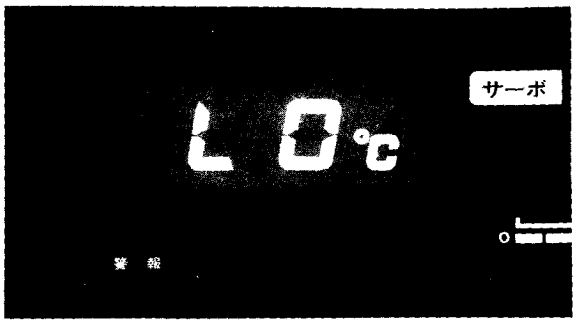
4-2-3 Attachment of skin temperature probe and operation of servo control unit

(1) Insert the skin temeprature probe plug firmly into the patient temperature probe connecting jack on the sensor



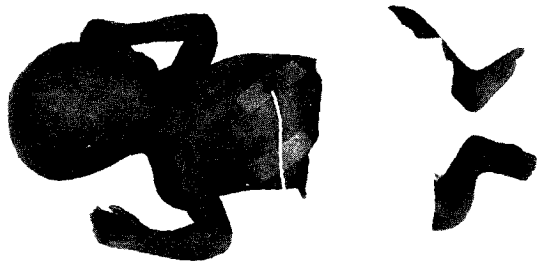
(Photo:14)

box on the right side of the hood and lock. The temperature detected by the probe is indicated on the skin temperature display. (Photo: 14)



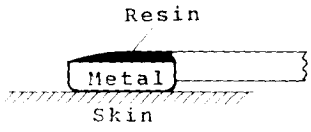
(Photo:15)

- The skin temperature display range is from 30.0°C to 42.0°C in 0.1°C steps. "LO" appears if the skin temperature is below 30.0°C, while "HI" appears if above 42.0°C. (Photo: 15)



(Photo:16)

(2) Attach the skin temperature probe to the infant between the umbilicus and ensiform process along the ventrimeson with a non-irritative adhensive tape. Clean the skin at the intended probe site with alcohol or lukewarm water to remove smegma embryonum and soil before attaching the probe. Place the heat sensing element at the tip of the probe



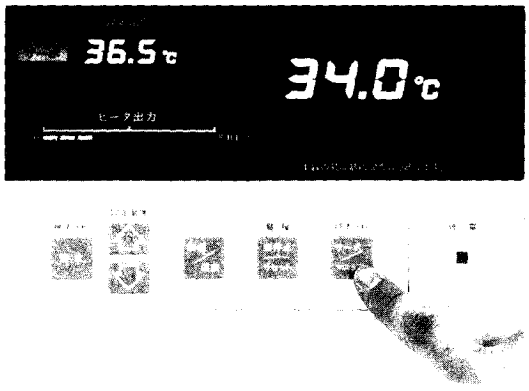
onto the intended skin site, ensuring that the metal disk maintains close contact with the skin. Secure the probe cord with a tape at an appropriate distance from the probe. (Photo:16)

NOTE 1: Make certain that the metal disk heat sensor maintains an airtight seal with the skin.

NOTE 2: Be sure to follow the doctor's instructions regarding the intended skin site in attaching the probe with the infant lying on its abdomen.

(3) Check by the skin temperature display four to five minutes after attaching the probe that the infant's skin temperature is stable.

(4) Press the servo/manual changeover switch continuously for approx. three seconds to change over to servo control. The "Servo" indicator lights up and the set temperature is also changed from the incubator temperature to the skin temperature. (Photo: 17)

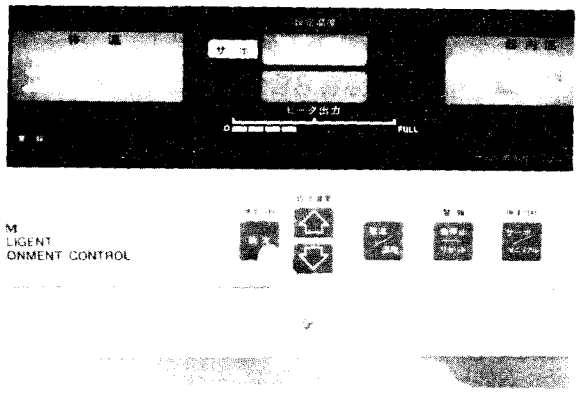


(Photo:17)

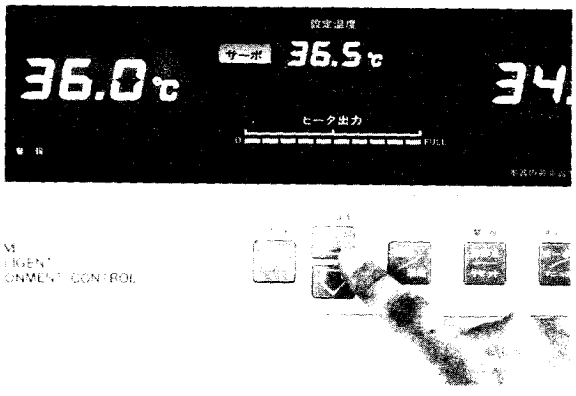
(5) To set or change the skin temperature, press the set switch continuously for approx. three seconds, and "Servo" indicator will flash. Press either ⇧ or ⇩ of the set temperature switch while the "Servo" indicator is flashing to set the skin temperature to the desired level.

(Photo:18) (Photo:19)

The set temperature can be changed while the "Servo" indicator is flashing. Setting is complete when the "Servo" indicator stops flashing and lights up.



(Photo:18)

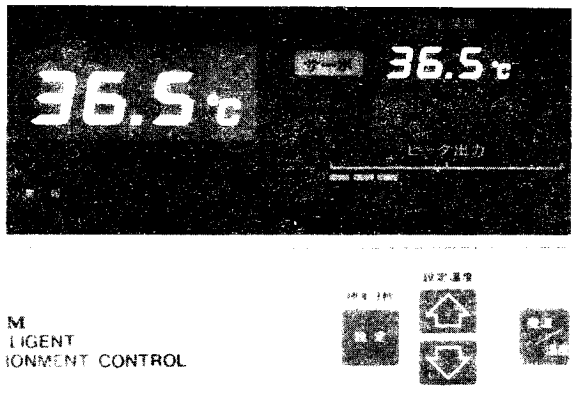


(Photo:19)

- The set temperature setting and display range is from 34.0°C to 38.0°C in 0.1°C steps.

▶ Be sure to follow the doctor's instructions when setting the skin temperature.

(6) As the skin temperature rises toward the set temperature, the heater output reading decreases slowly from FULL to a point of balanced heat supply required to maintain the infant's skin temperature at the prescribed level. (Photo: 20)



(Photo: 20)

The heater output reading may increase temporarily should the low incubator temperature preventive function or the oerating temeprature control function actuate. (See 4-2-7 on P.35)

■ Heater output indication

When the unit is operating in the servo mode, the heater output indicator indicates the amount of heat supplied as required to maintain the infant's skin temperature at the prescribed level.

The heater output reading shows not only the functioning of the infant's skin temperature control but also that of low incubator temperature prevention and operating temperature control features which actuate in response to the incubator temperature or the ambient temperature. (See 4-2-7 on P.35)

■ NOTE: During the servo mode operation, pay attention to the following points:

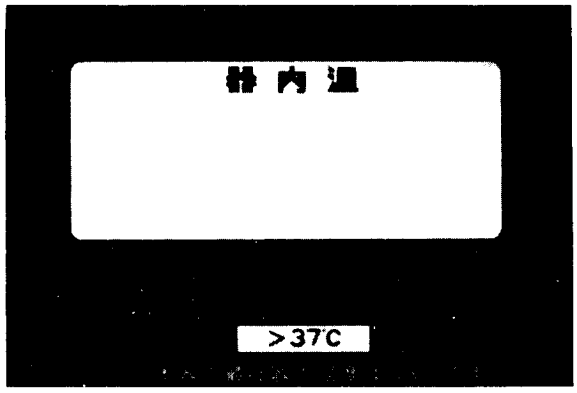
- If the skin temperature probe is not properly attached to the infant's abdomen, it will not detect the temperature accurately. If the probe is dislodged accidentally, the incubator temperature will have nothing to do with the infant's skin temeprature.
- If the skin temperature is covered with a blanket, diapers or the infant's arm and warmed, or if it gets wet with urine or fluid and cooled, it will not detect the temperature accurately.
- The set temperature may not be maintained should the infant develop a fever.

To change from the servo mode to the manual mode, press the servo-manual changeover switch continuously for approx. three seconds and turn the "Manual" indicator lamp on.

The infant's skin temperature can always be monitored on the skin temperature display while the skin temperature probe is attached to the infant's abdomen.

4-2-4 "＞37°C" indication

Should the incubator temperature exceed 37°C, the "＞37°C" indicator will light up and an audible alarm sound. (Photo:21)



(Photo: 21)

4-2-5 Alarms and alarm disable

See 4-1-5 on P.24 .

The servo control type is provided with an alarm for the skin temperature alarm.

4-2-6 Wall temeprature/humidity indication

See 4-1-6 on P.25 and select a desired display.

4-2-7 Characteristics of servo control and low incubator temperature preventive function

The servo control system controls the incubator temperature automatically in inverse proportion to the infant's skin temperature constant (at the set skin temperature) by raising the incubator temperature when the infant's skin temperature is lower than the set skin temperature or by lowering the incubator temeprature when the infant's skin temperature is

higher than the set skin temeprature.

The unit is provided with the low incubator temperature preventive function, which prevents the incubator temperature from dropping due to the infant's fever and other causes, and the operating temperature control function, which actuates when the ambient temperature has dropped. The infant's temperature is maintained in the following manner.

- Should the infant's skin temperature exceed the preselected temperature by less than 0.5°C, the lowest incubator temperature will be limited to be within 5°C of the skin temperature. On the other hand, should it exceed the preselected temeprature by more than 0.5°C, the lowest incubator temeprature will be limited to be no lower than 25°C. Therefore, the incubator temperature during servo control is controlled within the range of 25-38°C.

  (Example) Should the skin temperature rise to 36.8°C with the pre-selected temperature 36.5°C, the lowest incubator temperature is limited to be within 5°C of the temeprature, that is, the lowest incubator temperature in this example will be 31.8°C Should the skin temperature exceed the pre-selected temperature by more than 0.5°C and reach 37.2°C, the lowest incubator temeprature will be 25°C.

• Should the ambient temeprature drop exceedingly for some cause and the wall temeprature drop accordingly, the relation between the wall temeprature and the incubator temperature will be calculated by using "operating temperature" and the incubator temeprature will be raised. The "operating temperature" represents quantitatively total effect of the air temperature, radiation and convection on the incubator temperature by using not only the air temperature but also the wall temeprature in calculation. Hey* and others recommend the use of this operating temperature to represent the thermal environment for an infant in the incubator.

$$To = 0.6Tw + 04T_A$$

(To: operating temperature, Tw: wall temperature, T_A: incubator air temeprature)

The operating temperature for this unit is set to 29°C, and the incubator temeprature is controlled so that the operating temperature may not drop below 29°C.

〔Example〕 If the wall temperature drops to 26.0°C with the incubator temeprature 32.0°C,

$To = (0.6X26)+(0.4X32)=28.4°C$

Heat will be supplied by the heater so that the incubator temperature may rise and thus the operating temperature currently 28.4°C may rise above the pre-set level of 29°C.

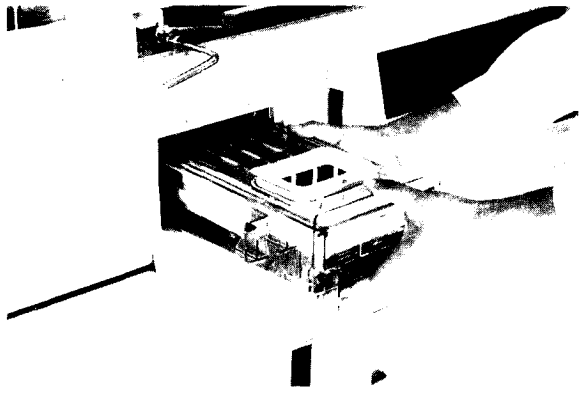
* Reference: Hey, E.N.,: The Care of Babies in Incubator. Recent. Adv. in Ped., 4:171, 1971.

5 HUMIDITY CONTROL

Humidity control must be effected, after the incubator temperature has stabilized, in accordance with the doctor's instructions.

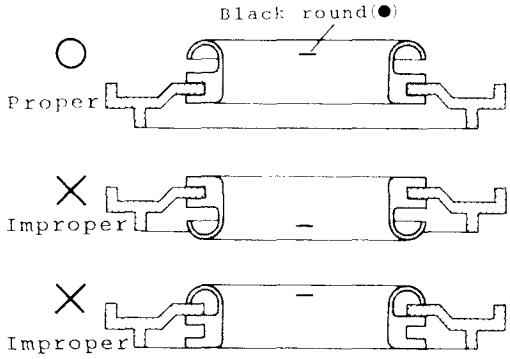
(1) Open the humidity reservoir cover and take out the humidity reservoir. Check to see that the humidification fin is properly set. Fill the humidity reservoir with sterile distilled water to the prescribed level "—". The reservoir capacity is about 1.6ℓ.

(Photo:22) (Photo:23)



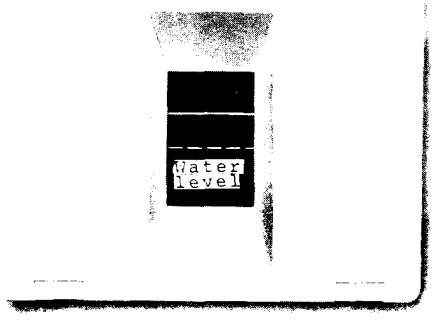
(Photo:22)

Correct fitting of humidity reservoir seal



▶ **NOTE** 1: Hold the humidity reservoir with both hands to attach or detach it. The humidity reservoir cover should be kept closed.

▶ NOTE 2: Even when no humidification is needed, the humidity reservoir should be fitted to the incubator module wihtout any water in it.



(PHoto:23)

▶ NOTE 3: If the humidity reservoir top cover or seal is not fitted at all or is fitted only improperly, it will lead to air or oxygen leakage. Avoid such mistakes. (See the figures.)

(2) The water level in the humidity reservoir should not be below the prescribed level indicated by the broken line. Supply distilled water as needed. The water level can be checked from outside the humidity reservoir cover.

(Photo: 23)

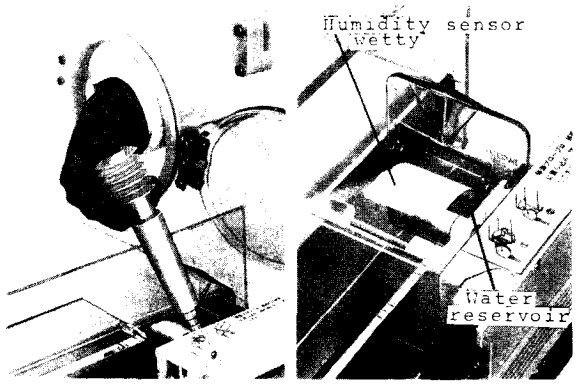
Change the reservoir water every 24 hours.

(3) Fill the water reservoir at the lower part of the humidity sensor with sterile distilled water. The accompanying filler or a syringe will be conveniently used for filling.

Next, fit the accompanying humidity sensor wetty to the humidity sensor and hang it down in the water reservoir.

(Photo: 24)

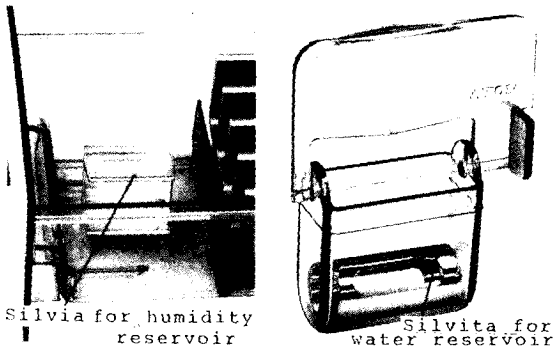
Change the distilled water in the water reservoir and the humidity sensor wetty every 24 hours.



(Photo:24)

■ Prevention of multiplication of micro-organisms in the humidity reservoir and the water reservoir

Addition of 1.5 to 2.5mℓ of 1:10,000 silver nitrate solution to the distilled water in the humidity reservoir will inhibit the multiplication of micro-organisms. Silvita (optional, with silver steam attached, available for humidity reservoir/water reservoir) will also inhibit the multiplication of micro-organisms if placed in the humidity reservoir and the water reservoir. Clean Silvita gently with a soft cloth soaked with a disinfectant detergent solution, once a week, and remove soils found on the surface. (Photo: 25)


Silvia for humidity reservoir

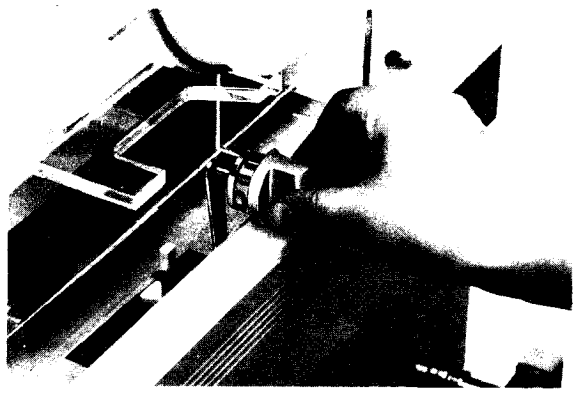
Silvita for water reservoir

(Photo:25)

(4) The humidification control sliding plate must be in the minimum humidification position until the incubator temperature has stabilized. Push the humidity control

knob provided on the left side of the hood and cause the inside arm to catch the projection on the humidification control sliding plate.

(Photo: 26)



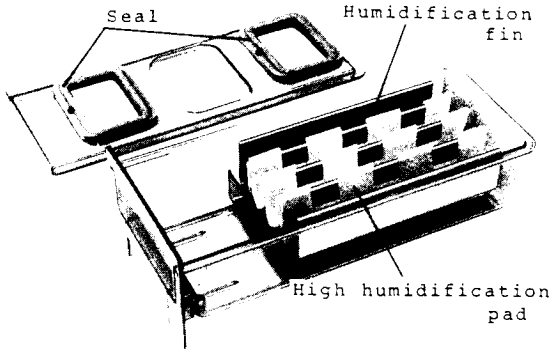
(Photo:26)

(5) When the incubator temperature has stabilized, set the humidification control sliding plate to the desired humidity level. If the temeprature in the hood is much higher than that of the room where the incubator is installed, the inner wall of the hood may in some cases be clouded up with moisture. This is a natural phenomenon and does not mean any excessive level of humidity generated within the incubator.

(6) If a higher humidity is needed than is achieved with the

humidification control sliding plate set to the maximum position, cover the humidification fin in the humidity reservoir with the accompanying high humidification pad.

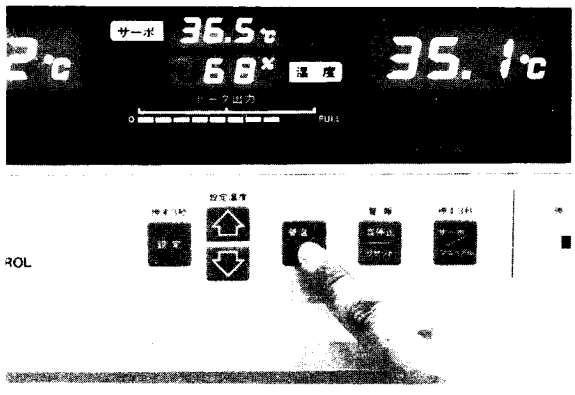
(Photo: 27)



(Photo:27)

(7) Press the wall temeprature/ humidity changeover switch to have humidity displayed. The humidity indicator lamp will light up and the humidity will be displayed within the range of 20 - 99% in 1% steps. (Photo:28) Press the switch, and the display will be changed over in the following order for selection:

"wall" ⇄ blank ⇄ "RH"



(Photo:28)

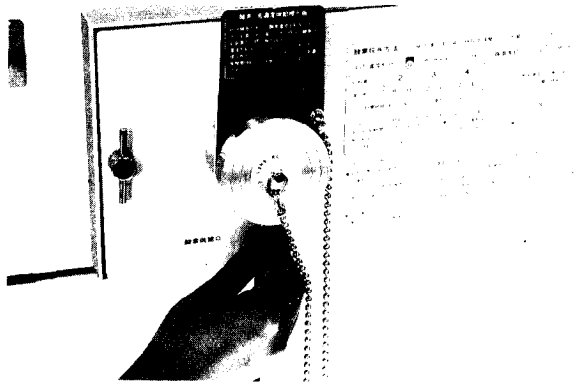
6 OXYGEN SUPPLY

The oxygen concentration must be determined in accordance with the doctor's instructions.

Close attention should be paid to the humidity level in the incubator during oxygen administration.

(1) Always use the oxygen flowmeter (optional) to administer oxygen at a desired flow rate. Connect the oxygen supply hose to the oxygen inlet located in the oxygen supply valve, and adjust the flowmeter.

(Photo: 29)

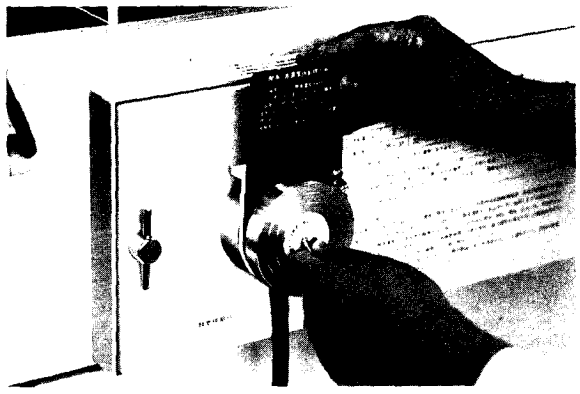


(Photo:29)

▶ NOTE: Do not use the oxygen supply valve when supplying humidified oxygen. Use of the oxygen supply valve during humidified oxygen supply from the humidifier bottle may result in malfunction of the oxygen supply valve.

(2) When an oxygen concentration below 40% is desired in the

incubator, fit the high oxygen administration indicating plate (red) on the oxygen supply port. (Photo: 30)



(Photo: 30)

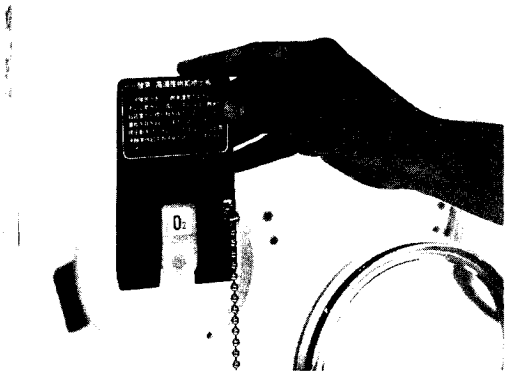
In this case, the amount of oxygen supplied into the incubator is adjusted automatically, and any excess oxygen gas is discharged from the incubator.

▶ The table below shows the oxygen concentration level in the incubator after 20 - 30 minutes following the start-up of the oxygen supply at the oxygen flow rates listed. These values were obtained, and are therefore appropriate, without an infant in the incubator. So oxygen flow figures should be considered only as estimated values.

Oxygen flow rate (ℓ/min)	2	3	4
Oxygen concentration (%)	28-31	32-36	37-40

(3) When an incubator oxygen level over 40% is desired, remove the high oxygen administration indicating plate (red) from the oxygen supply port and adjust the oxygen flowmeter

to supply oxygen at a desired rate. Hang the removed high oxygen administration indicating plate (red) on the hook on the rear of the hood to warn all the nursing staff that high concentration oxygen is now being supplied.



(Photo: 31)

(Photo: 31)

The oxygen concentration in the incubator stabilizes about 40 minutes after the oxygen supply is started. (Increase the oxygen flow rate when the incubator oxygen concentration is lower than desired, and conversely, decrease the flow rate when the concentration is higher.) Strict attention must be paid to variations in oxygen concentration, by monitoring the oxygen concentration level in the incubator with an oxygen monitor (at 10-minute intervals) till the oxygen concentration in the incubator stabilizes.

▶ NOTE: The high oxygen administration indicating plate must not be removed from the oxygen supply port except when high oxygen (over 40%) is being administered.

* If oxygen supply fails during high oxygen administration, room air is admitted automatically through the emergency

ventilation ports provided around the oxygen supply port for additional patient safety. However, maintain a close watch on the oxygen supply status during high oxygen administration.

■ General Precautions for Oxygen Administration

The oxygen concentration level within the incubator will vary depending on the operating condition of the unit, accuracy of the oxygen flowmeter, and other factors. Measure the oxygen concentration level in the incubator repeatedly with an accurate oxygen concentration meter to maintain the proper oxygen concentration level in the incubator. The concentration meter to be used should be periodically checked for accuracy with atmospheric oxygen (20.9%) and pure oxygen.

Be sure to follow the doctor's instructions to determine the optimum oxygen concentration level in the incubator on the basis of PO_2 (value of arterial oxygen partial pressure measured).

▶ NOTE: Administration of oxygen concentrations over 40% to an infant with cardiopulmonary diseases increases the risk of the infant developing retrolental fibroplasia (infant retinopathy). Oxygen concentrations under 40%, which were formerly considered safe for infants, may also possibly prove dangerous. However, when the oxygen concentration in the incubator is not sufficient to maintain the arterial

oxygen partial pressure within the normal range, a concentration of 60%, 80% or more is said to be necessary. Therefore, in cases where a high oxygen environment is needed, it is reported to be extremely important and necessary to measure the oxygen concentration level in the incubator repeatedly and analyze the arterial blood gases to determine the oxygen concentration level.

Action: Is the main deck placed properly? Isn't the air out-port, the air in-port or the incubator temperature sensor covered with diapers, etc.? Isn't the incubator temperature sensor covered with the humidity sensor wetty? If the above checks fail to identify the malfunction, the unit should be considered as being out of order.

Alarm disable: Press the alarm reset switch (the alarm disable switch). The alarm disable indicator will be illuminated and the audible alarm will be disabled for fifteen minutes.

Alarm reset: Should another alarm conditions occur during alarm disable, the alarm will be reset automatically. It will also be reset automatically when the unit is returned to normal conditions.

(2) In the servo mode of operation

Should the infant's skin temeprature deviate from the pre-selected temperature by more than $\pm$1°C, the selected temperature indicator lamp and the skin temeprature display figure will flash, and an audible alarm will sound. In case the skin temperature exceeds the pre-selected temperature by more than 1°C, a continuous audible alarm will sound and power supply to the heater will shut down. In case it drops below the pre-selected temperature by more than 1°C, an intermittent audible alarm will sound and power supply

to the heater will not shut down.

Action: Is the skin temperature probe attached securely? Isn't the skin temeprature probe covered with diapers, the infant's arm, etc. or isn't it wet with urine, disinfectant fluid, etc.? Hasn't the infant developed a fever? If the above checks fail to identify the malfunction, the unit should be considered to be out of order.

▶ See the preceding description in (1) for Alarm disable and Alarm reset.

7-4 Internal sensor alarm

Should any abnormality develop on any of the sensors for overtemeprature, internal air circulation, incubator air temperature, wall temeprature and humidity, or should the sensor block connector become disconnected, the "internal sensor" indicator lamp will flash and an audible alarm (intermittent/continuous) will sound. Power supply to the heater will shut down at the same time. Some alarm displays have "HI" or "LO" flash.

Action: Turn the power switch off and check the connection of each sensor and the sensor block connector. If no trouble is found with the connection or if "HI" or "LO" is flashing, the unit should be considered to be out of order.

Alarm reset: The alarm can not be reset during the alarm

conditions. Press the alarm reset switch after the unit is returned to normal conditions to reset the alarm.

▶ The audible alarm can not be disabled.

7-5 Skin temeprature probe alarm

Should the servo mode be selected without connecting the skin temperature probe to the sensor block, should the skin temperature probe plug become disconnected, or should any trouble develop on the skin temeprature probe, the "skin temperature probe" indicator lamp will flash and an audible alarm (intermittent/continuous) will sound. Power supply to the heater will shut down at the same time. Should any trouble develop on the skin temeprature probe, "HI" or "LO" will flash on the skin temperature display.

Action: Check the connection of the skin temeprature probe plug. If no trouble is found with the connection or if "HI" or "LO" is flashing, the unit should be considered to be out of order.

Alarm reset: The alarm can not be reset during the alarm conditions. Press the alarm reset switch after the unit is returned to normal conditions to reset the alarm.

▶ The audible alarm can not be disabled.

7-6 Power failure alarm

Should power supply be interrupted due to power failure, a disconnected power plug, a broken power cord, an activated circuit breaker or other causes, the "power failure" indicator lamp will be illuminated and a continuous audible alarm will sound.

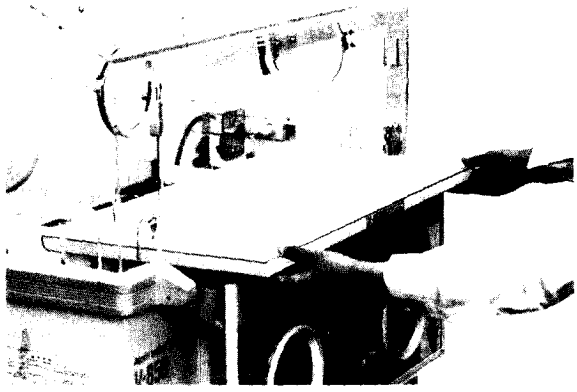
Action: See I. of [11] TOUBLESHOOTING GUIDE on P.74 for checks. If the checks fail to identify the malfunction, the unit should be considered to be out of order.

▶ The audible alarm can not be disabled. The alarm can not be reset.

3 OPERATION OF OTHER MECHANISMS

8-1 Mattress platform (I.C. hood)

Lower the front door and pull out the mattress platform with both hands from inside the incubator. (Photo: 32)
The mattress platform is so designed as to be locked in the drawn-out position.

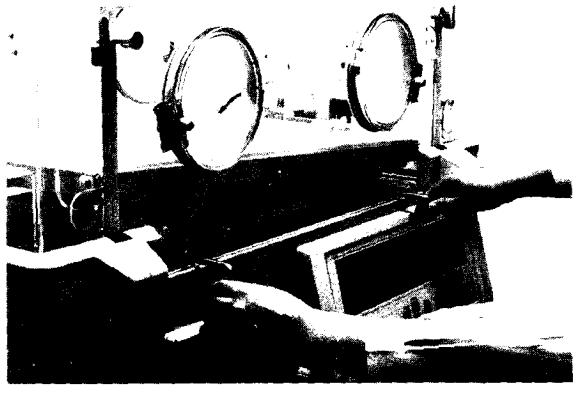


(Photo: 32)

- V-850W double-wall incubator is provided with warm air outlets all along the front door. The warm air outlets operate continuously, emitting a curtain of warm air, which prevents the incubator temperature from dropping.

8-2 Tilting of mattress platform

Two platform tilting arms are provided at both lower right and left of the incubator front. By operating them from outside the hood, the platform can be tilted or raised. Operate the tilting

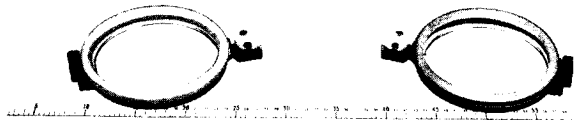


(Photo: 33)

arms gently. (Photo:33)

8-3 Infant height measurement

Use the height measuring scale printed on the inside of the hood to measure the infant's height. (Photo:34)

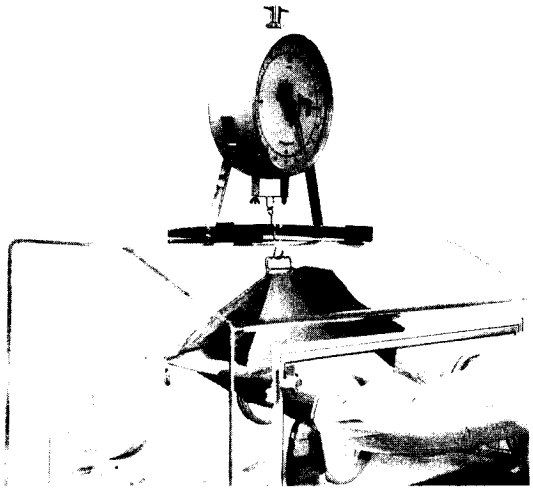


(Photo: 34)

As the zero point (0) on the scale is aligned with the left end of the mattress platform, it will be convenient to move the infant to the extreme left for measurement.

8-4 Infant weight measurement

The infant can be weighed by the ATOM suspension weighing scale (for incubator, optional) as it lies in the incubator. To weigh the infant, insert the hook of the weighing scale through the hole in the top of the hood and suspend the weighing sack with the infant in it. (Photo:35)

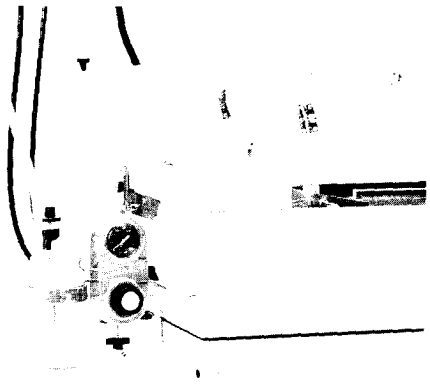


(Photo: 35)

8-5 High Humidification

High humidification can quickly be accomplished in the incubator, using the heated humidifier for incubator (optional item). Insert the mist supply hose into the incubator through the iris access port on the left side of the hood.

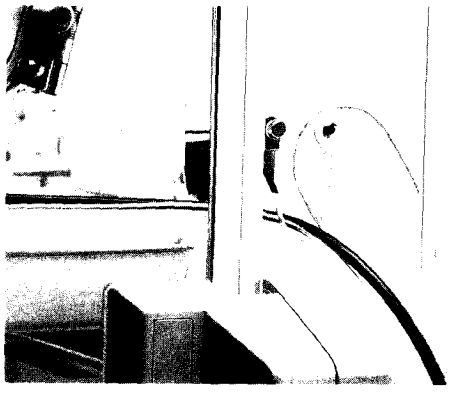
(Photo: 36)



(Photo:36)

8-6 Insertion of tubes

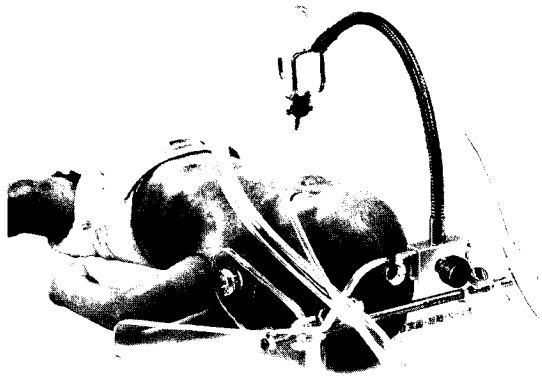
- A small access hole with a cover plate is provided at each lower hood front corner for tubing. I.V. tubing and monitor leads can be fed into the incubator through this small access hole. (Photo:37)
- When attaching a nasal cannula or tracheal catheter to the infant, use of the tube holding



(Photo:37)

frame (optional) enables the connecting tube to be fixed securely and facilitates treatment.

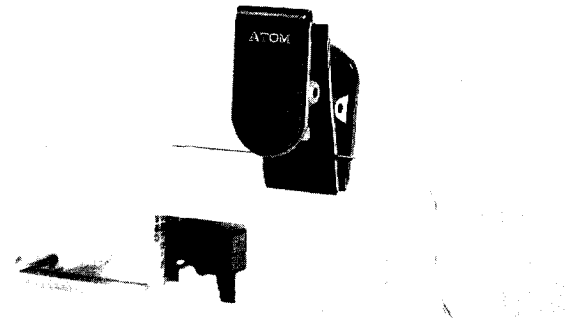
(Photo: 38)



(Photo: 38)

- The universal clip (optional) makes it simple and sure to guide tubing or fix the air bubble arrester tube.

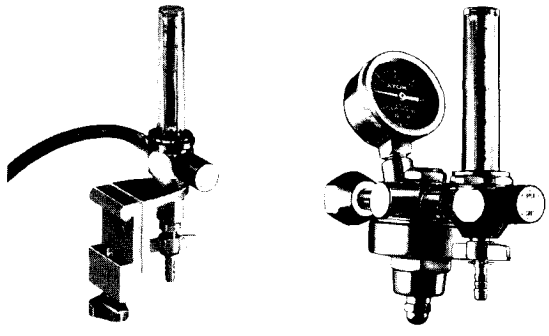
(Photo: 39)



(Photo:39)

8-7 Oxygen supply

Always use the oxygen flowmeter (optional) to administer oxygen at the desired flow rate. Connect the oxygen supply hose to the oxygen inlet located in the oxygen supply valve, and adjust the flowmeter.

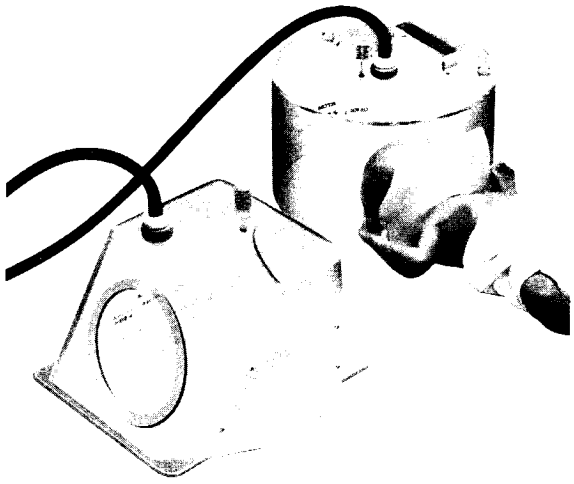


(Photo: 40)

An oxygen flowmeter with a pressure-decreasing adjuster should be used in connecting to an oxygen cylinder. (Photo: 40)

8-8 High concentration oxygen supply

When humidified oxygen is supplied to the infant with its head completely enclosed in the ATOM Oxygen head box (optional), oxygen concentrations over 90% can be achieved in a short time, which is convenient for treatment with high concentration oxygen. (Photo: 41)



(Photo: 41)

8-9 Prevention of radiant heat loss

An infant incapable of maintaining a desirable skin temeprature due to radiant heat loss can be protected against the effect of such heat loss if placed under the ATOM radiant heat shut-off hood (optional) in the incubator. (Photo: 42)

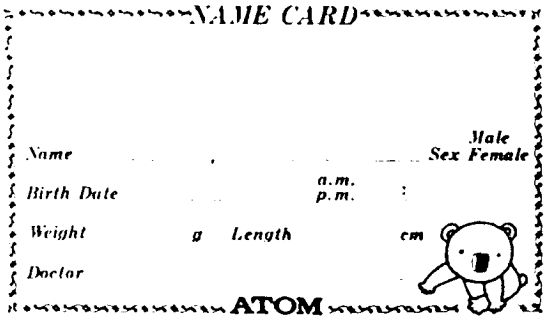
This hood is especially effective if used during the first few days of life when the infant's heat production level is low.

(Photo: 42)

* V-850W is provided with a double-wall hood, which prevents radiant heat loss.

8-10 I.D. card

Fill out the I.D. card with necessary details and hang it on the hook provided on the hood for infant identification. (Photo: 43)

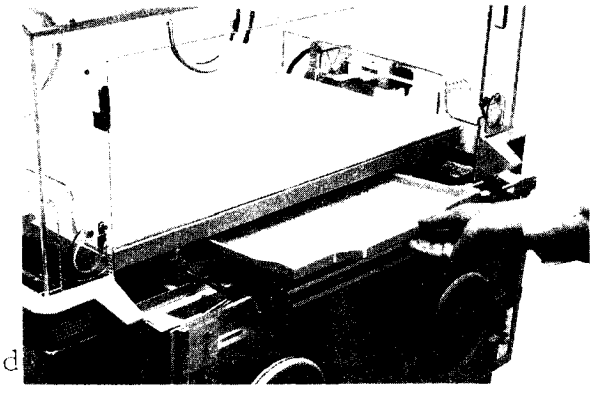


(Photo:43)

8-11 Radiography

A pull-out type X-ray cassette tray (optional), which is attached to the main deck, is convenient for taking an X-ray. (Photo:44)

▶ NOTE: The above-mentioned X-ray cassette tray can not be attached to V-850W double-wall incubator.

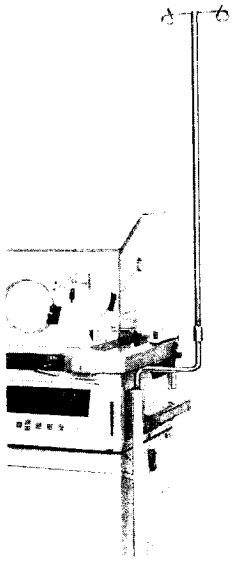


(Photo: 44)

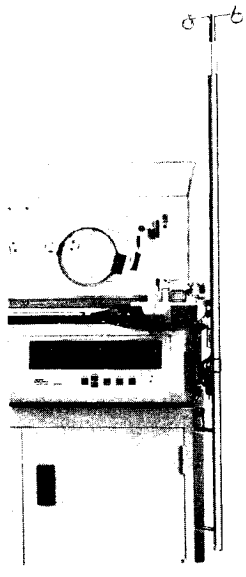
8-12 I.V. equipment

The I.V. pole (optional), to which an I.V. set, an infusion pump and other devices can be attached, is convenient for I.V. theraphy and infusion. (Photo:45,46)

The cabinet of the incubator is provided with screw holes for attaching an I.V. pole. The height



(Photo:45)



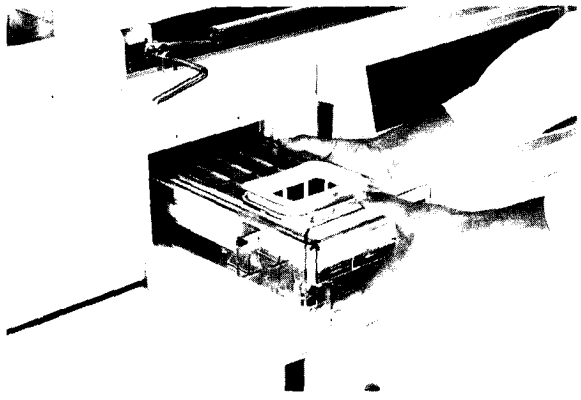
(Photo:46)

of the I.V. pole is adjusted and securely fixed by using a twist-lock system.

9 MANAGEMENT OF INCUBATOR IN USE

9-1 Changing of humidity reservoir water

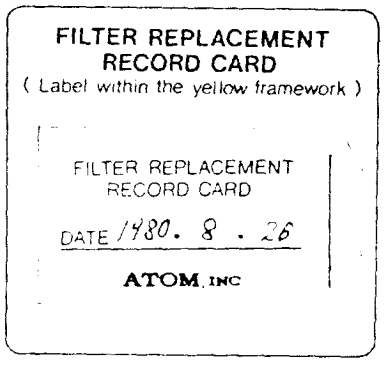
Change the reservoir water for fresh sterile distilled water every 24 hours.
Pull out the humidity reservoir with both hands and supply sterile distilled water to the specified level. (Photo:47)



(Photo: 47)

9-2 Replacement of filter

(1) Replace the filter with a new one every three months as a rule. However, the useful life of the filter depends on the air contamination level and frequency of usage. Replace the filter with a new-one, even if three months haven't passed since last replacement, when the outermost layer of the



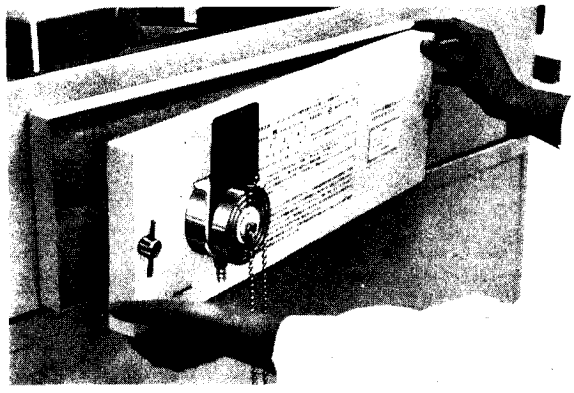
(Photo: 48)

filter has discolored through from the outer side to the other.

* Do not re-use the used filter by cleaning or reversing it.

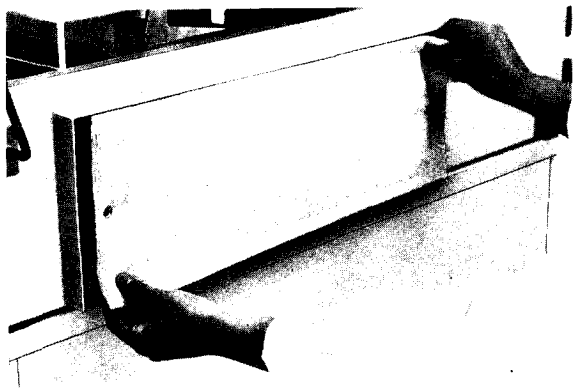
* Record each filter replacement date on one of the Filter Replacement Record cards supplied and stick the card onto an appropriate place as reminder of the next filter replacement date. (Photo:48)

(2) Loosen the two screws on both sides of the filter cover to remove it. (Photo:49)



(Photo:49)

(3) Remove the filter carefully to prevent dust on it from scattering. (Photo:50)



(Photo:50)

(4) Wipe thoroughly clean the surface and mounting portions of the filter cover with a piece of soft cloth soaked with a disinfectant detergent solution.

(5) Fix a new filter in position and screw the filter cover back on.

10 CLEANING, DISNINFECTING AND MAINTENANCE

To clean the incubator, follow the procedure described below. No tools are required to disassemble the incubator. A soft, clean cloth, and a disinfectant detergent solution are required for cleaning and disinfecting the equipment.

■ Suggested cleaning and disinfecting solutions are shown below

- 0.2 - 0.5% benzalkonium chloride solution
- 0.2 - 0.5% benzethonium chloride solution
- 0.02 - 0.05% chlorhexidine solution

▶ NOTE: Use of alcohol for cleaning and disinfecting is strictly prohibited.

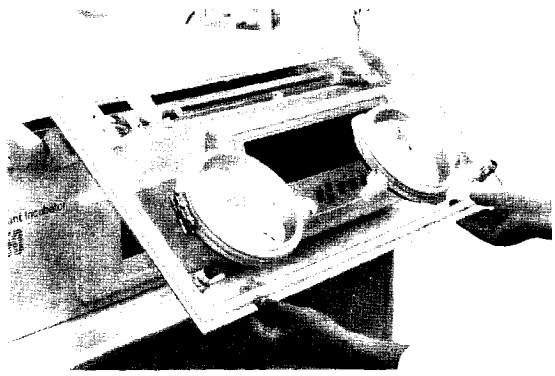
Do not ever use any of the above solutions in an undiluted state. Be sure to dilute **it with water before use.**

10-1 Attachment and detachment of inner panel of double-wall hood

10-1-1 Removal of inner panel of front door

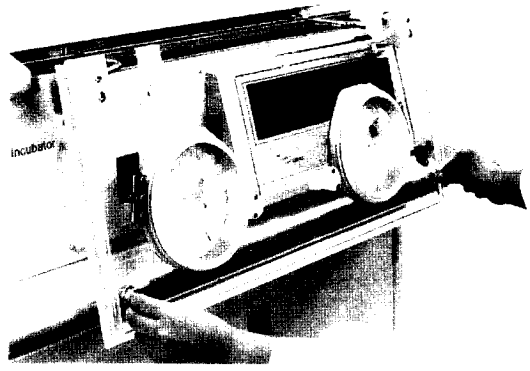
(1) Open the front door and let it down toward you so that the inner panel may face you.

(Photo:1)



(photo: I)

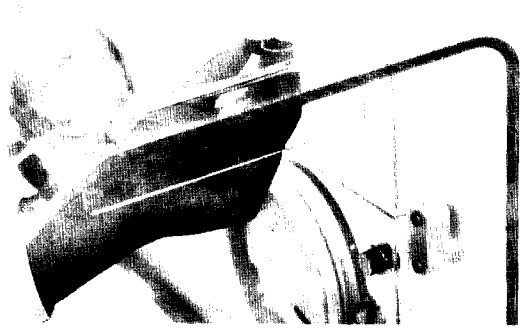
(2) Loosen the binding screws at the corners of the panel and remove the inner panel. (Photo: 2)



(Photo:2)

10-1-2 Removal of top panel

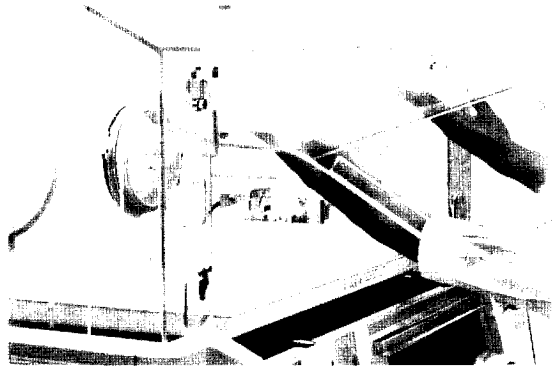
(1) Loosen the binding screws (black) at the far right corner of the top panel to let the top panel loose. (Photo:3)



(Photo:3)

(2) Hold the top panel with both hands and let it slide to the left. Take the top panel off the hooks located at two different sites.

(3) Hold the top panel with both hands and take it gently out of the front door. (Photo: 4)

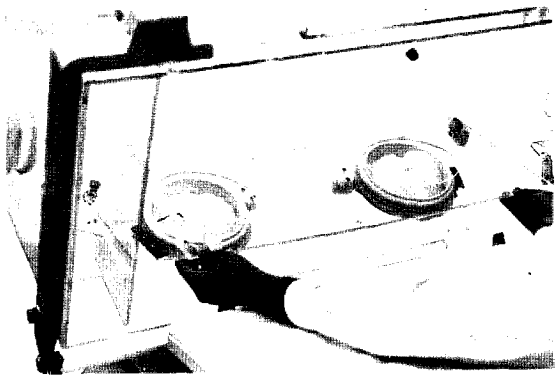


(Photo:4)

10-1-3 Removal of rear panel

(1) Close the front door. Raise the hood front with both hands and open the entire hood backward.

(2) Loosen the binding screws at the corners of the rear panel and remove the rear panel in the same manner as the inner panel. (PHoto:5)



(Photo:5)

10-2 Hood

(1) Remove all access port covers from iris or semi-iris access ports if provided on the hood.

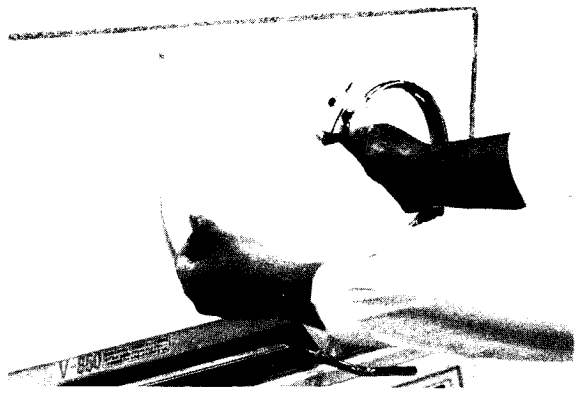
(2) Clean the inside and outside surfaces of the hood with soft cloth soaked with a disinfectant detergent solution. In the case of the double-wall hood, clean the inside and outside surfaces of the removed inner panel thoroughly, and after cleaning, screw the inner panel back securely onto the hook provided on the hood.

(3) The hood locks in the tilted position when its front end is raised. This is a safety mechanism to prevent the hood from inadvertently closing or swinging further back to cause an accident. To close the hood, hold it with the left hand, then pull the lock lever toward you to release the lock, and close the hood gently.

10-3 Access port cover

(1) Remove the access port covers, immerse and wash them clean in a disinfectant detergent solution.

(2) To attach an access port cover to a port, fit the smaller cover end around the inner access port rim. (Photo:51)



(Photo:51)

(3) Then fold back the access port cover in the middle, and fit the larger cover end around the outer access port rim. (Photo:52)

(Photo:52)

- Keep a supply of spare access port covers to replace the cover immediately when soiled.
- As for a semi-iris access port cover for the double-wall hood, fit one around the inner rim of a snap-open access port.

10-4 Snap-open access port rim seals

(1) Remove the snap-open access port rubber rim seals, immerse and wash them clean in a disinfectant detergent solution.

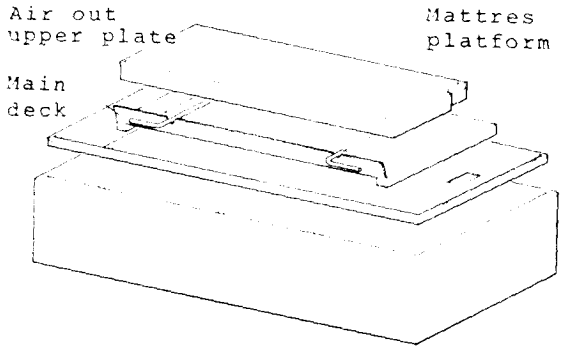
(2) After cleaning, push a rim seal in for the port rim to snugly fit into the groove in the seal, and fix the seal around an access port.

10-5 Mattress

- Since the mattress consists of special sponge hermetically enclosed in vinyl, there is no fear of the mattress interior getting contaminated unless the vinyl enclosure is damaged.
- Disinfect the mattress by immersing it entirely into a disinfectant detergent solution when a new infant is placed in the incubator.
- Keep a supply of spare mattresses and use only a disinfected one at the time of mattress change.

10-6 Mattress platform

Remove the mattress platform and clean it with a soft cloth soaked with a disinfectant detergent solution.



Mattress mount section of V-850W

10-7 Main deck

Turn the lock knob to the OPEN position, remove the main deck (and the air out upper plate of V-850W) and

clean with a soft cloth soaked with a disinfectant detergent solution.

10-8 Hood-incubator base seal

Remove the hood-incubator base seal from the conditioning chamber and disinfect it with a disinfectant detergent solution.

10-9 Front door seal

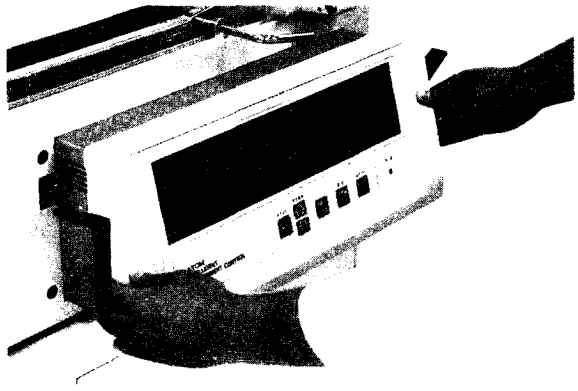
Remove the front door rubber seal from the front door, immerse and disinfect it in a disinfectant detergent solution.

10-10 Power unit

Prior to cleaning and disinfecting the power unit, ensure that the heater has sufficiently cooled.

(1) Disconnect the power cord and the sensor connector.

(2) Pull up the two levers located on the left and the right to release the lock. Take the power unit out of the incubator module by grasping the power unit with both hands and pulling it out straight. (Photo:53)



(Photo:53)

10-13 Humididty reservoir

(1) Take out the humidity reservoir with both hands, remove the top cover and drain the humidity reservoir completely of distilled water.

(2) Clean the humidity reservoir and the top cover with a soft cloth soaked with a disinfectant detergent solution. Sterilization by autoclaving for thirty minutes at 121°C is also available. Immerse and disinfect the humidity reservoir rim seal in a disinfectant detergent solution.

(3) Clean Silvita for the humidity reservoir and the humidification fin with a soft cloth soaked with a disinfectant detergent solution.

10-14 Humidity sensor

(1) The humidity sensor wetty is disposable. Use a new humidity sensor for each patient to prevent cross infection.

(2) Clean the water reservoir for the humidity sensor and Silvita with a soft cloth soaked with a disinfectant detergent solution. Sterilization by autoclaving for thirty minutes at 121°C is also avaialble.

10-15 Conditioning chamber

The conditioning chamber is of a sanitary structure with sufficiently rounded corners. Clean the inside and outside

of the conditioning chamber with a soft cloth soaked with a disinfectant detergent solution. (Photo:57)

(Photo:57)

10-16 Assembly

After cleaning, assemble the unit according to the following procedure.

(1) Place the humidification fin in the conditioning chamber and fit the latter to the incubator module.

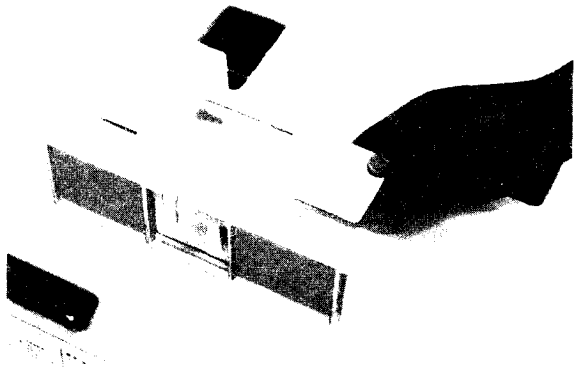
(2) Fit the air intake pipe to the power unit.

(3) Fit a new filter to the incubator module.

(4) Fasten the power unit to the incubator module with the levers provided on the left and the right.

(5) Fit the hood seal around the upper edge of the conditioning chamber.

(6) Fit the humidification control sliding plate appropriately to a specified place. (Photo:58)



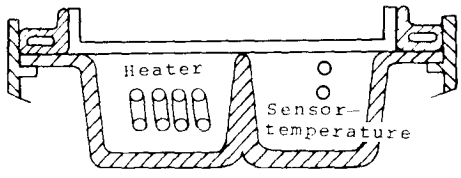
(Photo:58)

(7) Place the main deck on the conditioning chamber and lock securely. (Photo:59) In so doing, take care to ensure that the main deck does not sit aslant on any part of the hood seal. As for V-850W, make sure that the air out upper plate is placed at an appropriate place on the mian deck.

(Photo:59)

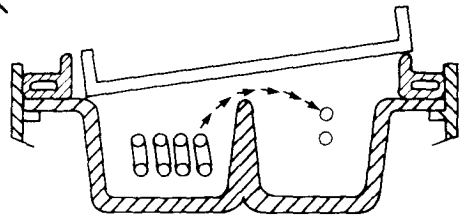
■ Mount the main deck correctly.

○



Correct position of the main deck

×



Incorrect position of main deck

The main deck sitting on the hood-incubator base seal makes proper incubator temeprature control impossible.

(8) Place the mattress platform properly on the main deck. Ensure that the mattress platform is so designed as to

be locked in the drawn-out position.

(9) Place the mattress on the mattress platform.

(10) Re-check the position of the main deck before closing the hood.

(11) Lock the connecting hood on the side of the cabinet, and securely fasten the incubator module to the cabinet.

10-17 Post-assembly check

Having completed assembly, check that the incubator operates properly.

11 TROUBLE-SHOOTING GUIDE

Check the following points before requesting repair service.

See 7 ALARMS on P. 48 for troubles and actions associated with alarm conditions.

1. Nothing is displayed on the panel and power failure alarm actuates even though the power switch is ON.	• Isn't the incubator circuit breaker interrupting the circuit (in floating condition)? • Is the power plug securely inserted in the socket outlet? • Isn't the main hospital circuit breaker interrupting the circuit? (Check by plugging another electrical device into the same outlet and see if it works.)
2. Incubator temperature does not rise.	• Isn't the skin temperature control switch (in SC mode) or the incubator temperature control switch (in MC mode) set to a low temperature level? • Hasn't the infant in the incubator in servo control developed a fever? • Isn't the power voltage low? (Use a separate socket outlet for each incubator.) • Is the air circulating fan attached properly? • Isn't the main deck sitting on the hood-incubator base seal?

3. Incubator temperature rises too high.	• Isn't the skin temperature control switch (in SC mode) or the incubator temeprature control switch (in MC mode) set to a high temperature level? • Isn't the incubator in direct sunlight or isn't there a heat source such as a stove or a radiator close by? • Is the skin temperature probe attached properly to the infant? • Isn't the air in-port clogged with diapers, gauze, etc.?
4. Humidity does not increase.	• Isn't the humidification control sliding plate set to the minimum level? • Isn't the air out-port clogged with diapers, gauze, etc? • Is the humidity reservoir filled with distilled water? • Is the humidification fin placed without fail? * Should high humidity be needed, cover the humidification fin with the high humidification pad.

5. Humidity rises too high.	• Isn't the humidification control sliding plate set to the maximum level? * When the relative humidity is extremely high as in the rainy season, get water out of the humidity reservoir.
6. Incubator hood collects moisture.	• Isn't there great difference between the room temperature and the incubator temperature?
7. Oxygen concentration does not rise.	• Is oxygen being accurately supplied? • Check the oxygen flow rate in the oxygen flowmeter. • Is the power unit positioned correctly? • Is the humidity reservoir placed? Is the humidity reservoir seal fitted? • Is the hood-incubator base seal properly positioned? • Are access ports tightly closed? • Is the filter cover securely fitted?
8. The skin temperature indicator does not function properly.	• Isn't the skin temperature probe attached improperly to the infant?

	* Place the heat sensing element (thermistor) of the skin temepr-ature probe tightly onto the infant's abdomen and completely cover and secure the probe with a tape.

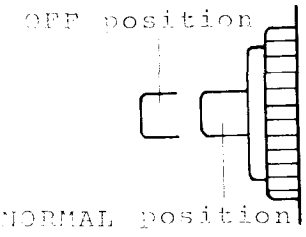
■ If all the above-listed checks fail to identify the malfunction, the unit should be considered as being out of order and in need of repair. Indicate by a sign on the incubator that the unit is "OUT OF ORDER", and contact your ATOM distributor.

■ How to reset the circuit breaker

Should any abnormal over-current occur during operation of the unit, the circuit breaker shuts off the power to prevent an accident. Reset the breaker in the following procedure.

(1) **Turn the power switch off.**

(2) Wait at least for one minute after the circuit breaker activation. Then press the circuit breaker reset switch back to the NORMAL position.



(3) Turn the power switch on. Should the circuit breaker, once reset, be activated again, contact your ATOM distributor.

▶ NOTE: The circuit breaker can not be reset till at least one minute has elasped since the time of its last activation.

12 CAUTIONS FOR SAFE INCUBATOR OPERATION

- Avoid placing the incubator in such locations as may adversely affect the incubator temperature.

- NO SMOKING: for safty it is necessary that all sources of ignition be kept away from the incubator, and preferably out of the room in which it is being used.

- The skin temperature, the incubator temeprature, the oxygen concentration and humidity should be determined and set according to the doctor's instructions.

- An infant should be placed in the incubator after the incubator temperature has fully stabilized.

- The heat sensor of the skin temperature probe must be attached properly to the infant with a non-irritative tape, ensuring that the metal disk maintains close contact with the skin. Otherwise, accurate skin temperature cannot be detected.

- The high oxygen administration indicating plate at the oxygen supply port must never be removed except during high oxygen administration.

- Do not use the oxygen supply valve when supplying humidified oxygen.

- When the oxygen administration equipment is in use, pay special attention to the following.

  - A spontaneous and violent ignition may occur if oil,greasy substances come in contact with oxygen under pressure. These substances must be kept away from oxygen regulators, cylinder valves, tubing and connections, and all other oxygen equipment.

  - To avoid the neccessity for handling heavy cylinders in the nursery, it is recommended that wherever located outside the nursery. In any event, cylinders in use should be fixed in place so they will not be knocked over, and should be located as far as practicable from the incubator.

fiercely in spontaneous combustion when in contact with pressurized oxygen, must be kept away from the oxygen supply apparatus, such as oxygen pressure regulators, cylinder valves, pipes and joints.

- On high pressure oxygen cylinders, use only approved reducing or regulation valves maked for oxygen service. Do not use these valves for air or gases other than oxygen. since they may be hazardous when returned to oxygen service. Such equipment must be operated strictly in accordance with manufacturer's direction.

- Mixtures of oxygen and flammable vapors, such as alcohol ether ethylene and cyclopropane may axplode if ignited. Such mixtures may be ignited by electrical static spark discharges, or high temperature surfaces, in addition to all other more common sources of ignition. Only equipment designed for use in hazardous locations should be used in delivery rooms.
  - Clothing and sheeting used for the infant must be of pure cotton, and clothing which can be readily charged electrostatically should not be used.
  - It is recommended that the clothing put on by medical, nursing and ambulance personnel be either of pure cotton or flame-proof.
- Even when no humidification is needed, the humidity reservoir should be fitted to the incubator module without any water in it.
- The front door and access ports should be opened as rarely

as possible to avoid fluctuations in the incubator temperature. Never leave the incubator with the front door or access ports open.

- Use a disinfectant detergent solution or ethylene oxide gas for cleaning and disinfecting. Use of alcohol for cleaning and disinfecting the hood is strictly prohibited.
- Do not cover the air circulating route including the air out-port and the air in-port with diapers or other articles. Otherwise accurate temperature control can not be achieved.
- The main deck should not sit aslant on any part of the hood seal. Otherwise temperature cannot be controlled accurately or the oxygen concentration cannot be maintained properly. Place the main deck properly and fasten securely with a stopper.
- Securely lock the incubator module and the cabinet with the connecting hook.
- Do not pull or twist cables excessively.
- If a failure is detected, indicate by a sign on the incubator that the unit is "OUT OF ORDER" and contact an expert for repair.

CAUTIONS FOR SAFE OPERATION OF V-850W

- The unit is so designed that the warm air circulating between the inner and outer walls makes the inner wall warm

and thus prevents the infant's radiant heat loss. The warm air outlets emit a curtain of warm air when the front door is open. Unless the inner wall is installed, the infant in the incubator might get in direct touch with the warm air. Therefore never fail to install the inner wall.

- When the front admittance panel is open, pay special attention to the infant in the incubator so that it might not get in direct touch with the warm air forming an air curtain.